DISSERTATION ON

STUDY OF BACTERIOLOGIC PROFILE IN CRITICAL CARE SETTINGS AND EFFECTS OF PREVENTIVE MEASURES

Submitted to

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfilment of the regulations
for the award of the degree of

M.D. BRANCH - I
GENERAL MEDICINE
MADRAS

MADRAS MEDICAL COLLEGE AND GOVERNMENT GENERAL HOSPITAL, CHENNAI – 3

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY CHENNAI, INDIA

APRIL 2012

DECLARATION

I solemnly declare that this dissertation entitled "**STUDY OF BACTERIOLOGIC PROFILE IN CRITICAL CARE SETTINGS AND EFFECTS OF PREVENTIVE MEASURES"** was done by me at Madras Medical College and Rajiv Gandhi Government General Hospital during 2009-2012 under the guidance and direct supervision of **Prof. C.RAJENDIRAN, M.D.,** Director and Professor of Medicine, Institute of Internal Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3. This dissertation is submitted to the Tamil Nadu Dr. M.G.R. Medical University towards the partial fulfillment of requirements for the award of M.D. Degree in General Medicine (Branch-I).

Place: Chennai **(DR. S. ANNE PRINCY)**

Date:

ACKNOWLEDGEMENT

At the outset, I thank **Prof. V.KANAGASABAI M.D.,** Dean, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 for having permitted me to use the hospital data for the study.

I am very much thankful to **Prof. V.PALANI M.S.,** Medical Superintendent, Rajiv Gandhi Government General Hospital, Chennai-3 for permitting me to carry out my study.

I am indebted to **Prof. C.RAJENDIRAN M.D.,** Director and Professor of Medicine, Institute of Internal Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 for his support and his painstaking efforts and guidance in scrutinizing the study.

I thank **Prof. S.RAGUNANTHANAN M.D.,** Professor of Medicine, Institute of Internal Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 for his guidance throughout the study.

I thank **Dr. S.BASKER M.D., Dr. M.ANUSUYA M.D., Dr. SUNDAR M.D., Dr. V.RAJENDRAN M.D., Dr. D.RAMESH M.D., Dr. D.THANGAM M.D.,** Assistant Professors of Medicine, Institute of Internal Medicine, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 for their contributions to the study.

I am grateful to **Prof. THANGAM MENON, PhD.** Head of Department, Department of Microbiology, Dr. ALM PG Institute of Basic Medical

Sciences (IBMS), Taramani and their Post Graduate students who rendered active support and guidance in testing the samples of this study.

I thank all my professional colleagues for their support and valuable contributions and criticisms.

Last but not the least, I would wish to thank all the patients without whose kind cooperation, this study would not have been possible.

CERTIFICATE

This is to certify that the dissertation entitled **"STUDY OF BACTERIOLOGIC PROFILE IN CRITICAL CARE SETTINGS AND EFFECTS OF PREVENTIVE MEASURES"** is a bonafide work done by Dr. S.ANNE PRINCY, post graduate student, Institute of Internal Medicine, Madras Medical College, Chennai-3 in partial fulfillment of the University Rules and Regulations for the award of MD Branch – I General Medicine, under my guidance and supervision, during the Academic period from April 2009 to April 2012.

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CONTENTS

INTRODUCTION

Health Care Associated Infection (HCAI), also referred to as "nosocomial" or "hospital" infection, is defined as:

"An infection occurring in a patient during the process of care, in a health care facility, which was not present or incubating at the time of admission. An infection manifested >48 hours after admission is defined as hospital acquired. This includes infections acquired in the hospital but appearing after discharge and also occupational infections among the staffs."

HCAI is acknowledged as the most frequent adverse event in health care, but the global burden remains unknown because of the difficulty of gathering reliable data. This is mainly due to the complexity and lack of uniformity of diagnostic criteria and to the fact that surveillance systems for HCAI are virtually non-existent in most countries.

Hospital acquired infections are a serious problem in patient care and adversely affect the mortality and morbidity. The affected areas are mainly the ICU and acute wards where the patients are critical and immune-compromised. Nosocomial infections complicate the primary disease process and create problems like septicemia and ARDS. They remain endemic in critical care wards and lead to epidemic outbreaks.

Health Care Associated Infections (HCAI) are preventable errors. The improvement of the quality of the health care is a major concern for intensive care professionals because, the patients of the ICU are thought to be particularly at risk of errors due to complexity of the patients, interdependence of the practitioners, and dependence on team functioning, ensuring patients' safety during their hospital stay which requires mechanisms to determine the incidence of adverse events. In the ICU, the accumulation of a number of immuno-compromised patients and their nursing and invasive procedures provide a favorable environment to the growth and transmission of nosocomial infections. The use of a ventilator or a central venous catheter, and ICU acquired drug-resistant infections were associated with a high risk of hospital mortality in ICU patients.

The potential impact on hospital mortality emphasizes the importance of preventive measures against ICU acquired infections; ICU acquired infection is common and often associated with microbiological isolates of resistant organisms. The potential effects on outcome emphasize the importance of specific measures for infection control in critically ill patients. Continued surveillance, along with sound infection control programs, not only lead to decreased health care associated infections but also better prioritization of resources and efforts to improving medical care.

AIMS & OBJECTIVES

- To identify the prevalence and pattern of infections in critical care area.
- To identify the predominant infecting organisms.
- To determine the bacteriologic profile.
- To see if there is any significant reduction in the incidence of hospital acquired infections by adoption of preventive measures.

REVIEW OF LITERATURE

The word NOSOCOMIAL infection is derived from Latin word *nosocomium* [1] hospital, Greek meaning *nosokomeion, nosokomos* one who tends the sick, from *nosos* disease + *-komos*[2] *;* akin to Greek *kamnein* to suffer, toil, Sanskrit *śāmyati* he tires[3].

HISTORICAL MILESTONES

One of the earliest records of hospital infections are perhaps those found in an Egyptian papyrus[4] written around 3000 B.C. Needless to say, mere absence of documentation of bacterial infection does not exclude its prevalence prior to this time.

Nearer home, in the Indian context, a similar account of hospital infection is available in the ancient Ayurvedic literature (Ca. 600 B.C.). Again the famous Hindu physician Charaka and surgeon Sushuruta[5] (Ca. 400 B.C.) have also emphasized the need for prevention of infection in clinical practice. Elsewhere in the world too, there is ample evidence that hospital infections were prevalent and documented in ancient times viz: the records of Herodatus[6] on the conditions that prevailed in Greek and Roman hospitals in the period 1000 to 600 B.C., and the Hippocrates treatise (Ca 400 BC) testifying the existence of infections[7].

For several subsequent centuries that followed, it was generally believed that the disease was caused by the contagion[8] and spread by wind and various

other types of air currents. It soon became recognized that certain medicaments were capable of either preventing or checking the progress of infection. **Place in 1721** used the term **Antiseptics**[9] to describe these substances and, nearly 30 years later, **Pringle in 1750**[10] conducted extensive trials with antiseptics while working with the British army in Flanders.

In **1856 Louis Pasteur** conclusively demonstrated that bacteria were responsible for fermentation of wine, which could be prevented by gentle heating whereby the micro-organisms were destroyed[11]. The existence of such micro-organisms in the atmosphere was proved by him in 1864. In his celebrated lecture to **Acadimie de Medicine on April 30th, 1873**[12]**,** Louis Pasteur is quoted[13] as having said:

> **"If I had the honour of being a surgeon, not only would I use absolutely clean instruments, but after cleaning my hands with the greatest care would only use sponges previously raised to a heat of 1300-1500 Fahrenheit. I would still have to fear germs suspended in the air, and surrounding the bed of the patient".**

The now well known work of **Semmelweiss (1861)**[14] on puerperal sepsis was largely disregarded at that time. He observed that puerperal sepsis was associated with medical staff and students who attended patients and also performed autopsies. Semmelweiss deduced that morbid matter present on their hands derived from cadavers[15] or other patients was responsible for spread of

the disease. A drastic reduction in infection rates was achieved by the introduction of hand washing practices with chlorinated lime[16].

In 1969, **Lister** introduced his antiseptic theory[17], following the extensive use of carbolic acid[18] to pack wounds, especially of compound fractures, sterilize instruments and sutures, and to decontaminate his hands. He observed that these practices could greatly reduce the incidence of suppuration and gangrene, which quite commonly occurred otherwise.

In **1883, Gustao Neubar** introduced the use of masks and gowns in surgery[19], and **Halsted in 1890**, introduced the use of rubber gloves[20] in surgery. Steam sterilization[21] was discovered by **Von Bergman in 1896** and all these measures further increased the safety of surgery and contributed greatly in bringing down rates of infection by use of aseptic and antiseptic techniques. During the period, when many fundamental discoveries in bacteriology were being made, other principles of hospital infection control were also simultaneously established.

BACKGROUND

The ICU is highly specified and sophisticated area of a hospital which is specifically designed, staffed, located, furnished and equipped, dedicated to management of critically ill patients, injuries or complications[22]. It is a department with dedicated medical, nursing and allied staff. It operates with defined policies, protocols and procedures, having its own quality control, education, training and research programmes.[23]

Patients in Intensive Care Units (ICUs) have a higher risk of acquiring hospital associated infections than those in non-critical care areas. ICUs are sites of considerable broad spectrum antibiotic use, and antibiotic resistant pathogens are frequent. Bloodstream infections (BSIs), pneumonias, and Urinary Tract Infections (UTIs) are the most common hospital acquired infections and are most often associated with the use of invasive devices.[24]

FREQUENCY OF INFECTION

Every year, thousands of patients die of hospital acquired infections (HAI) in India. Death due to HAI is responsible for more mortality than any other forms of accidental death in the country. The irony is, about one–third of all such cases are preventable.

"According to the report by the INICC in 2006, overall 1.4 million people worldwide are suffering from nosocomical infections and in India alone, the infection rate is at over 25 per cent,"[25] HAI are mainly device associated infections. Devices are invasive procedures and thus they cause infection due to contamination of devices. Since patients in the ICU are likely to have multiple devices for treating or monitoring their care, it is not surprising that the most common nosocomial infections are pneumonia (endotracheal tubes), urinary tract infections (urinary catheters) and catheter related blood stream infections. Urinary catheter, ventilator associated, and catheter associated bloodstream infections are common complications of care provided in the ICU. Attributable

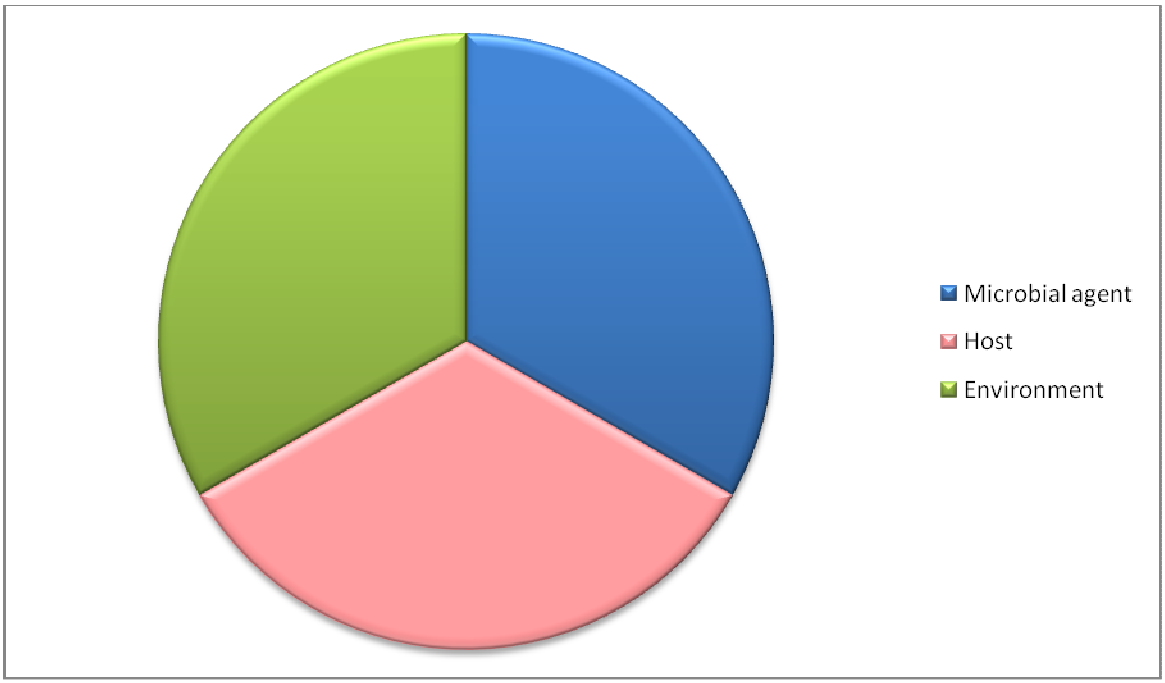
mortality for pneumonia occurring in the ICU population alone is between 5 – 14%.

Several studies [26,27,28,29] have shown that the utilisation of invasive devices such as venous and urinary catheter, ETT, intracranial pressure monitoring devices is a major risk factor for the development of nosocomial infections in ICU. Thus the incidences of such infections are expressed as number of infection/1000 device utilisation days. Early removal of such invasive devices will eliminate the risk of such device associated infections. However critical conditions of many ICU patients often require continued use of these catheters, tubes, and drains.

Similarly, contamination during care of the devices also causes infection. Most common HAI is ventilator associated pneumonia (VAP). The incidence of VAP is 11 per 1,000 device days followed by catheter associated blood stream infection (BSI) which is 8 per 1000 device days and then by urinary tract infections.[30]

Data reveals that HAI increases the length of stay from 2 to 5 days and thereby increasing cost to patients. As per an estimate in Argentina, the increase in cost due to HAI is around $5000 and in India, it could be about Rs. 25,000 to 100,000 depending on severity and hospital[31].

FACTORS INFLUENCING THE DEVELOPMENT OF NOSOCOMIAL INFECTIONS



THE MICROBIAL AGENT[33]

The patient is exposed to a variety of micro-organisms during hospitalization. Contact between the patient and a micro-organism does not by itself necessarily result in the development of clinical disease, but other factors also influence the nature and frequency of nosocomial infections. The likelihood of exposure leading to infection depends partly on the characteristics of the micro-organisms, including resistance to antimicrobial agents, intrinsic virulence, and amount (inoculum) of infective material. Many different bacteria, viruses, fungi and parasites may cause nosocomial infections. Infections may be caused by a micro-organism acquired from another person in the hospital (cross-infection) or may be caused by the patient's own flora (endogenous infection). Some organisms may be acquired from an inanimate object or substances recently contaminated from another human source (environmental

infection). Most infections acquired in hospital today are caused by micro-organisms which are common in the general population, in whom they cause no or milder disease than among hospital patients (*Staphylococcus aureus*, *coagulase-negative staphylococci, Enterococci, Enterobacteriaceae).*

PATIENT SUSCEPTIBILITY[34]

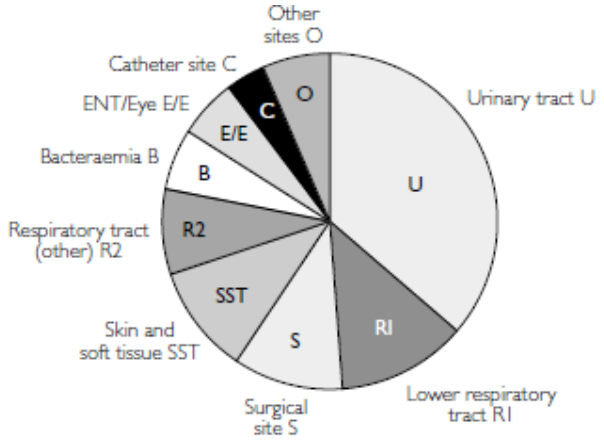
Important patient factors influencing acquisition of infection include age, immune status, underlying disease, and diagnostic and therapeutic interventions. The extremes of life — infancy and old age — are associated with a decreased resistance to infection. Patients with chronic diseases such as malignant tumors, leukemia, diabetes mellitus, renal failure or the acquired immunodeficiency syndrome (AIDS) have an increased susceptibility to infections with opportunistic pathogens. Immunosuppressive drugs or irradiation may lower resistance to infection. Injuries to skin or mucous membranes bypass natural defense mechanisms. Malnutrition is also a risk. Many modern diagnostic and therapeutic procedures, such as biopsies, endoscopic examinations, catheterization, intubation/ventilation and suction and surgical procedures increase the risk of infection.

ENVIRONMENTAL FACTORS[35]

Health care settings are an environment where both infected persons and persons at increased risk of infection congregate. Patients with infections or carriers of pathogenic micro-organisms admitted to hospital are potential sources of infection for patients and staff. Patients who become infected in the

hospital are a further source of infection. Crowded conditions within the hospital, frequent transfers of patients from one unit to another, and concentration of patients highly susceptible to infection in one area (e.g. newborn infants, burn patients, and intensive care) all contribute to the development of nosocomial infections. Microbial flora may contaminate objects, devices, and materials which subsequently contact susceptible body sites of patients

NOSOCOMIAL INFECTION SITES



Adapted fom Enquête nationale de prévalence des infections nosocomiales, 1996. *BEH*, 1997, 36:161–163.

URINARY INFECTIONS

Urinary infection is the most common nosocomial infection, 80% of infections are associated with the use of an indwelling bladder catheter[36, 37, 38]. Urinary infections are associated with less morbidity than other nosocomial infections, but can occasionally lead to bacteraemia and death. Infections are usually defined by microbiological criteria: positive quantitative urine culture ($\geq 10^5$ micro-organisms/ml, with a maximum of 2 isolated microbial species).

The bacteria responsible arise from the gut flora, either normal (*Escherichia coli*) or acquired in hospital (multi-resistant *Klebsiella*).

NOSOCOMIAL PNEUMONIA

Nosocomial pneumonia[39] occurs in several different patient groups. The most important are patients on ventilators[40] in intensive care units, where the rate of pneumonia is 3% per day. There is a high case fatality rate[41] associated with ventilator associated pneumonia, although the attributable risk is difficult to determine because patient's co morbidity is so high.

The definition of pneumonia may be based on clinical and radiological criteria which are readily available but non-specific: recent and progressive radiological opacities of the pulmonary parenchyma, purulent sputum, and recent onset of fever. Diagnosis is more specific when quantitative microbiological samples are obtained using specialized protected bronchoscopy methods. Known risk factors[42] for infection include the type and duration of ventilation, the quality of respiratory care, severity of the patient's condition (organ failure), and previous use of antibiotics.

Apart from ventilator associated pneumonia, patients with seizures or decreased level of consciousness are at risk for nosocomial infection, even if not intubated. Viral bronchiolitis (respiratory syncytial virus, RSV) is common in children's units, and influenza and secondary bacterial pneumonia may occur in institutions for the elderly. With highly immune-compromised patients, *Legionella* spp. and *Aspergillus* pneumonia may occur.

NOSOCOMIAL BACTERAEMIA

These infections represent a small proportion of nosocomial infections (approximately 5%) but case fatality rates[43] are high — more than 50% for some micro-organisms. The incidence is increasing; particularly for certain organisms such as multi-resistant coagulase negative *Staphylococcus* and *Candida* spp. Infection may occur at the skin entry site of the intravascular device[44], or in the subcutaneous path of the catheter (tunnel infection). Organisms colonizing the catheter within the vessel may produce bacteraemia without visible external infection. The resident or transient cutaneous flora is the source of infection. The main risk factors are the length of catheterization, level of asepsis at insertion, and continuing catheter care.

TABLE I. **Simplified criteria for surveillance of nosocomial infections**

Type of nosocomial infection	Simplified criteria
Surgical site infection	Any purulent discharge, abscess, or spreading cellulitis at the surgical site during the month after the operation
Urinary infection	Positive urine culture (1 or 2 species) with at least 10^5 bacteria/ml, with or without clinical symptoms
Respiratory infection	Respiratory symptoms with at least two of the following signs appearing during hospitalization: — cough — purulent sputum — new infiltrate on chest radiograph consistent with infection
Vascular catheter infection	Inflammation, lymphangitis or purulent discharge at the insertion site of the catheter
Septicaemia	Fever or rigours and at least one positive blood culture

OTHER NOSOCOMIAL INFECTIONS

These are the four most frequent and important nosocomial infections, but there are many other potential sites of infection. For example:

- **Skin and soft tissue infections**: open sores (ulcers, burns and bedsores) encourage bacterial colonization and may lead to systemic infection.
- **Gastroenteritis** is the most common nosocomial infection in children, where rotavirus is a chief pathogen: *Clostridium difficile* is the major cause of nosocomial gastroenteritis in adults in developed countries.
- **Sinusitis** and infections of the **eye and conjunctiva**.
- **Endometritis** and other infections of the reproductive organs following childbirth.

MICRO-ORGANISMS

Many different pathogens may cause nosocomial infections. The infecting organisms vary among different patient populations, different health care settings, different facilities, and different countries.

BACTERIA

These are the most common nosocomial pathogens. A distinction may be made between:

Commensal bacteria[45] found in normal flora of healthy humans. These have a significant protective role by preventing colonization by pathogenic micro-organisms. Some commensal bacteria may cause infection if the natural host is compromised.

Pathogenic bacteria[46] have greater virulence, and cause infections (sporadic or epidemic) regardless of host status. For example:

- Anaerobic gram-positive rods (e.g. *Clostridium*) cause gangrene.

- Gram-positive cocci - *Staphylococcus aureus* (cutaneous bacteria that colonize the skin and nose of both hospital staff and patients) cause a wide variety of lung, bone, heart and bloodstream infections and are frequently resistant to antibiotics; beta hemolytic *streptococci* are also important.
- Gram-negative bacteria- Enterobacteriacae (e.g. *Escherichia coli*, *Proteus*, *Klebsiella*, *Enterobacter*, *Serratia marcescens*), may colonize sites when the host defenses are compromised (catheter insertion, bladder catheter, cannula insertion) and cause serious infections (surgical site, lung, bacteraemia, peritoneum infection). They may also be highly resistant. Gram-negative organisms such as *Pseudomonas* spp. are often isolated in water and damp areas. They may colonize the digestive tract of hospitalized patients.
- Selected other bacteria are a unique risk in hospitals. For instance, *Legionella* species may cause pneumonia (sporadic or endemic) through inhalation of aerosols containing contaminated water (air conditioning, showers, and therapeutic aerosols).

VIRUSES

There is the possibility of nosocomial transmission of many viruses, including the hepatitis B and C viruses (transfusions, dialysis, injections, endoscopy), respiratory syncytial virus (RSV), rotavirus, and enteroviruses (transmitted by hand-to-mouth contact and via the faeco-oral route). Other

viruses such as cytomegalovirus, HIV, Ebola, influenza viruses, herpes simplex virus, and varicella-zoster virus, may also be transmitted.

PARASITES AND FUNGI

Some parasites (e.g. *Giardia lamblia*) are transmitted easily among adults or children. Many fungi and other parasites are opportunistic organisms and cause infections during extended antibiotic treatment and severe immune-suppression (*Candida albicans*, *Aspergillus* spp., *Cryptococcus neoformans*, *Cryptosporidium*). These are a major cause of systemic infections among immune-compromised patients. Environmental contamination by airborne organisms such as *Aspergillus* spp. which originate in dust and soil is also a concern, especially during hospital construction. *Sarcoptes scabies* (scabies) is an ectoparasite which has repeatedly caused outbreaks in health care facilities

RESERVOIRS AND TRANSMISSION

Bacteria that cause nosocomial infections can be acquired in several ways:

1. **The permanent or transient flora of the patient** *(endogenous infection*[47]*)*

   Bacteria present in the normal flora cause infection because of transmission to sites outside the natural habitat (urinary tract), damage to tissue (wound) or inappropriate antibiotic therapy that allows overgrowth (*C. difficile*, yeast spp.). For example, gram-negative bacteria in the digestive tract frequently cause surgical site infections after abdominal surgery or urinary tract infection in catheterized patients.

2. **Flora from another patient or member of staff** *(exogenous cross-infection*[48]*)*

Bacteria are transmitted between patients:

a) Through direct contact between patients (hands, saliva droplets or other body fluids)

b) In the air (droplets or dust contaminated by a patient's bacteria)

c) Via staff contaminated through patient care (hands, clothes, nose and throat) who become transient or permanent carriers, subsequently transmitting bacteria to other patients by direct contact during care

d) Via objects contaminated by the patient (including equipment), the staff's hands, visitors or other environmental sources (e.g. water, other fluids, food)

3. **Flora from the health care environment**[49] *(endemic or epidemic exogenous environmental infections)*

Several types of micro-organisms survive well in the hospital environment:

- In water, damp areas, and occasionally in sterile products or disinfectants (*Pseudomonas*, *Acinetobacter*, *Mycobacterium*)
- In items such as linen, equipment and supplies used in care; appropriate housekeeping normally limits the risk of bacteria surviving

- As most micro-organisms require humid or hot conditions and nutrients to survive
- In food
- In fine dust and droplet nuclei generated by coughing or speaking (bacteria smaller than 10 μm in diameter remain in the air for several hours and can be inhaled in the same way as fine dust)

SOURCES OF CROSS INFECTION [50, 51, 52] IN THE ICU

- Hands of staff and attendants (via two bowl hand washing and communal towels or no hand washing)
- Assisted ventilation equipment
- Suction and drainage bottles
- I.V. lines – central and peripheral
- Urinary catheters
- Wounds and wound dressings
- Disinfectant containers
- Dressing trolleys (on which disinfectants jars/bottles are stored)

SURVEILLANCE

Surveillance[53] is the systematic ongoing collection, collation and analysis of data with timely dissemination of information to those who require it in order to take action. The actions usually relate to improvements in prevention or control of the condition. Health care associated infections are an important and

growing hospital and public health concern. Both the prevalence of antibiotic resistant organisms and of a vulnerable, immuno-compromised population is increasing in hospitals and long term care homes. There is conclusive evidence to show that the establishment of a surveillance system for HAIs is associated with reductions in infection rates. Surveillance is also useful in monitoring the effectiveness of preventive and infection control programs.

There are several established components to an active & effective surveillance system:

1. PLANNING

Because it is not feasible to monitor all types of infections at all times, choosing which infections will be surveyed is based upon an initial assessment that will establish the priorities for the surveillance system[54]. An initial assessment will include:

- The types of patients/residents that are served by the health care setting
- The key medical interventions and procedures that are provided in the health care setting
- The frequency of particular types of infections within a particular health care setting
- The impact of the infection (including per cent case fatality and excess costs associated with the infection)
- The preventability of the infection

Surveillance for some types of infections and syndromes, such as Febrile Respiratory Illness (FRI) and Gastrointestinal Illness (GI) are currently part of routine practice in all health care settings.

2. DATA COLLECTION

Collection of infection data for surveillance purposes[55] must be done using validated, published definitions for HAIs. In order to generate valid HAI rates, information must be collected on those who develop a HAI and those who do not develop infection. Electronic screening[56] of patient records is an emerging tool for identification of potential HAIs. These computerized systems of case finding will reduce the time spent by infection control professionals in case finding.

3. DATA ANALYSIS

It is recommended that incidence density rates be calculated[57] i.e., the measurement of new cases of infection (incidence) based on the time at risk in the patient/resident population, e.g., length of stay in a hospital. It may be useful in hospitals to stratify rates of surgical site infections by standardized risk scores[58] in order to compare the rates to other hospitals. An electronic spreadsheet/database and/or statistical analysis program should be used in hospitals and long-term care homes to store data and calculate HAI rates, to maximize infection prevention and control resources and reduce the potential for errors associated with manual calculations.

4. INTERPRETATION OF DATA

Surveillance data requires interpretation to identify areas where improvements to infection prevention and control practices can be implemented to lower the risk of HAI. This investigation is particularly essential where major deviations from the baseline HAI rate may indicate the presence of an outbreak[59]. Analysis and interpretation of infection data may be done with the facility's Infection Prevention and Control Committee or other advisory body to the Infection Control Team. HAI rates may be compared to both the facility's own previous HAI rates and benchmarks, or to external standards or benchmarks set by other health care settings[60].

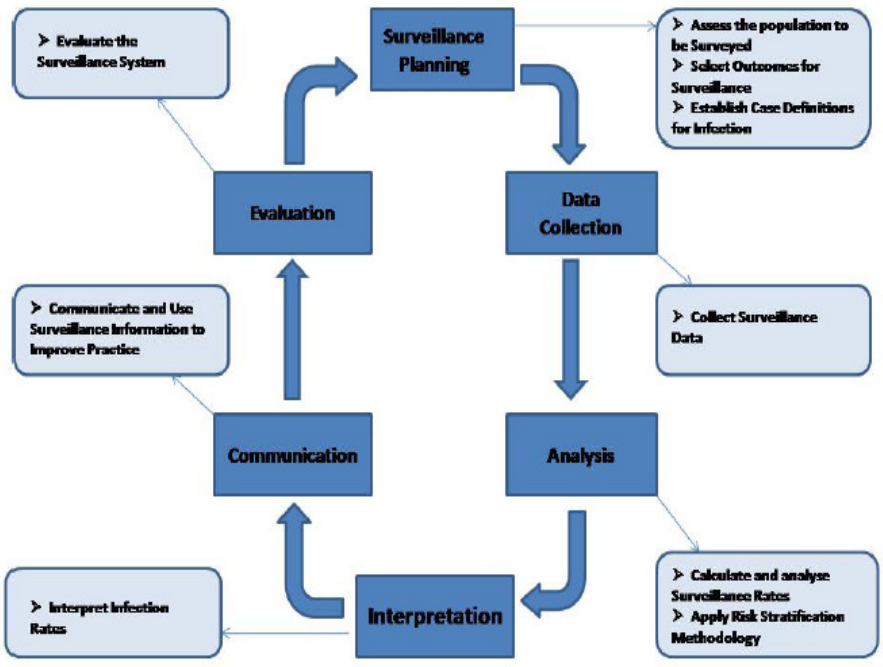
5. COMMUNICATION OF RESULTS

Communication of surveillance data should take place on an ongoing, systematic basis and be targeted[61] to those with the ability to change infection prevention and control practice. Communication may be targeted to:

- A health care setting's Infection Prevention and Control Committee, which provides an aggregate picture of all infections of interest in the hospital
- A particular patient/resident care area or specialty care area, focused on the risk of specific types of infections that are of importance to these groups
- Patient/resident care staff following the identification of an emerging risk of infection, to remind or to notify the required precautions in infection prevention and control

6. EVALUATION

Periodic review[62] of the surveillance system should be part of regular Infection Prevention and Control Committee meetings in hospitals and long-term care homes and should include an assessment of the outcomes to which the surveillance system contributes. Evaluation should include how information produced by a surveillance system is used to reduce the risk of health care associated infection[63]. Outcome evaluation should take place at least annually and a realignment of surveillance objectives undertaken when indicated. The steps provided in this best practices guide will assist infection prevention and control professionals to develop and implement their surveillance programs in a manner that will permit comparisons with their peers and allow them to quickly detect early increases in health care associated infections that may indicate the presence of an outbreak.



DESIRED CHARACTERISTICS OF A NOSOCOMIAL INFECTION SURVEILLANCE SYSTEM[64, 65, 66]*

1. CHARACTERISTICS OF THE SYSTEM

- Timeliness, simplicity and flexibility
- Acceptability and reasonable cost
- Representativeness (or exhaustiveness)

2. QUALITY OF THE DATA PROVIDED

- Sensitivity and specificity
- Predictive value (positive and negative)
- Usefulness, in relation to the goals of the surveillance (quality indicators)

* Adapted from Thacker SB, 1988 (*4*).

KEY POINTS IN THE PROCESS OF SURVEILLANCE FOR NOSOCOMIAL INFECTION RATES

- Active surveillance (prevalence and incidence studies)
- Targeted surveillance (site, unit, priority-oriented)
- Appropriately trained investigators
- Standardized methodology
- Risk adjusted rates for comparisons

An effective surveillance system must identify priorities for preventive interventions and improvement in quality of care[67]. By providing quality indicators, surveillance enables the infection control programme, in

collaboration with patient care units, to improve practice, and to define and monitor new prevention policies. The final aim of surveillance is to decrease nosocomial infections and reduce costs.

Surveillance is a continuous process which needs to evaluate the impact of interventions to validate the prevention strategy, and determine if initial objectives are attained.

PREVENTIVE MEASURES

ENVIRONMENTAL MANAGEMENT PRACTICES

A clean environment plays an important role in the prevention of hospital associated infections (HAI) [68]. Many factors, including the design of patient care areas, operating rooms, air quality, water supply and the laundry can significantly influence the transmission of HAI.

CLEANING OF THE HOSPITAL ENVIRONMENT

Routine cleaning is important to ensure a clean and dust free hospital environment[69]. There are usually many micro-organisms present in "visible dirt", and routine cleaning helps to eliminate this dirt. Administrative and office areas with no patient contact require normal domestic cleaning. Most patient care areas should be cleaned by wet mopping[70]. Dry sweeping is not recommended. The use of a neutral detergent solution improves the quality of cleaning. Hot water (80°C) is a useful and effective environmental cleaner. Bacteriological testing of the environment is not recommended unless seeking a potential source of an outbreak.

Any areas visibly contaminated with blood or body fluids should be cleaned immediately with detergent and water. Isolation rooms and other areas that have patients with known transmissible infectious diseases should be cleaned with a detergent disinfectant solution at least daily. All horizontal surfaces and all toilet areas should be cleaned daily.

ENVIRONMENTAL CLEANING[71]

DAILY

- Cleaning must be done daily with the hospital approved cleaner. All surfaces must be wiped with a damp cloth to remove dust and dirt
- Cleaner/disinfectants should be identified by the Intensive care team and used as indicated. High level disinfectants (HLD) are not used for environmental cleaning.
- Cleaner/disinfectants should be kept closed when not in use.

TERMINAL

- When patients are discharged from the unit, a thorough cleaning of the bed and bedside equipment must be completed before admitting new patients.

SCHEDULED

- A total cleaning of all areas, including the store clean and soiled storage areas should be done at least every 1-2 weeks.
- Separate mops and cleaning utensils should be used for cleaning of the unit.

- Cleaning equipment should be wiped & properly stored when not in use.

UNIT DESIGN[72]

Unit design should consider the following to enhance infection control strategies.

SPACE

BEDS

The beds should be 2.5 - 3 meters (7-9 feet) apart, to allow free movement of staff and equipment, reducing risk of cross contamination. Ideally, a sharps container should be within easy access of each bed.

PARTITIONS

Privacy partitions should be of material that is easily cleaned and should be cleaned weekly and any time that it becomes soiled or contaminated. If curtains are used, they should be changed weekly and between patients.

MEDICATION PREPARATION

Medication preparation areas should be separate from patient care areas and should be maintained as a clean area.

CLEAN STORAGE

An area should be identified and maintained for clean storage and should be separate from care and waste disposal areas.

SOILED AND WASTE STORAGE

An area should be identified for storing collected bedside waste and should be maintained separate from direct care and clean medication areas.

Ideally, this area should have a clinical sink for the disposal of blood and body fluid waste. The area should include storage of filled sharps containers until these containers can be removed.

TOILETS

May be located outside the ICU.

SINKS AND WATERLESS HAND RUB DISPENSERS

Sinks should be placed near the ICU entrance and at key points, within the unit in order to provide ease of access to the care givers. If this is not feasible, waterless hand rub dispensers[73] should be available at the ICU entrance and at each bedside.

VENTILATION

TYPE

The source of clean air should be determined including central or through the wall air conditioning units. System should be evaluated for proper functioning and preventive maintenance.

The air conditioning filters should be cleaned periodically and fans that can spread airborne pathogens should be avoided in high risk areas. High risk areas such as operating rooms, critical care units and transplant units require special ventilation systems. Filtration systems (air handling units) designed to provide clean air should have high efficiency particulate air (HEPA) filters[74] in high risk areas. Unidirectional laminar airflow systems should be available in appropriate areas in the hospital construction.

WINDOWS

Windows should remain closed in order to control all airborne risks.

VISITORS

Design of the unit should permit staff to assess visitors for communicable disease (e.g. rash, respiratory infection) before permitted to enter unit. They should be instructed in washing their hands if assisting the patient.

WATER

Drinking water should be safe[75] for oral ingestion. National norms and international recommendations define appropriate criteria for clean drinking water. Even water that conforms to accepted criteria may carry potentially pathogenic micro-organisms. Organisms present in tap water have frequently been implicated in nosocomial infections. These micro-organisms have caused infection of wounds (burns, surgical wounds), respiratory tract, and other sites (semi critical equipment such as endoscopes rinsed with tap water after they have been disinfected). *Legionella* spp. lives in hot water networks where the temperature promotes their development within protozoan phagosomes; tap aerators facilitate proliferation of these and other micro-organisms, such as *Stenotrophomonas maltophilia*.

FOOD[76]

Quality and quantity of food are key factors for patient convalescence. Ensuring safe food is an important service delivery in health care.

- Maintain a clean work area.

- Maintain scrupulous personal hygiene among food handlers, especially hand washing, as hands are the main route of contamination.
- Staff should change work clothes at least once a day, and keep hair covered.
- Avoid handling food in the presence of an infectious disease (cold, influenza, diarrhoea, vomiting, throat and skin infections), and report all infections.
- Use appropriate cooking techniques and follow recommendations to prevent growth of micro-organisms in food.
- Food handlers should receive continuing instruction in safe practices.
- Separate raw and cooked food to avoid cross contamination.
- The catering system environment must be washed often and regularly with tap water and appropriate detergents (and/or disinfectants).

LAUNDRY

General instructions

LINEN[77]

The basic principles of linen management are as follows:

- Place used linen in appropriate bags at the point of generation.
- Contain linen soiled with body substances or other fluids within suitable impermeable bags and close the bags securely for transportation to avoid any spills or drips of blood, body fluids, secretions or excretions.
- Do not rinse or sort linen in patient care areas (sort in appropriate areas).

- Separate clean from soiled linen and transport/store separately.
- Wash used linen (sheets, cotton blankets) in hot water (70°C to 80°C) and detergent, rinse and dry preferably in a dryer or in the sun. (Heavy duty washers/dryers are recommended for the hospital laundry.)

BEDDING

- Mattresses and pillows with plastic covers should be wiped over with a neutral detergent.
- Mattresses without plastic covers should be steam cleaned if they have been contaminated with body fluids. If this is not possible, contaminations should be removed by manual washing, ensuring adequate personnel and environmental protection.
- Wash pillows either by using the standard laundering procedure or dry clean if contaminated with body fluids.

WASTE MANAGEMENT

Hospital waste is a potential reservoir of pathogenic micro-organisms and requires appropriate, safe and reliable handling. The main risk associated with infection is sharps contaminated with blood[78]. There should be a person or persons responsible for the organization and management of waste collection, handling, storage and disposal. Waste management should be conducted in coordination with the infection control team. Steps[79] in the management of hospital waste include:

- Generation.

- Segregation/separation.
- Collection.
- Transportation.
- Storage.
- Treatment.
- Final disposal.

METHODS OF DISPOSAL

SHARPS

- Autoclave, shred and land fill or microwave, shred and land fill or treat by plasma pyrolysis of puncture proof containers storing discarded sharps.
- Deep burial in a secure area. Burial should be 2 to 3 meters deep and at least 1.5 meters above the groundwater table.

Waste requiring incineration:

- Anatomical parts and animal carcasses.
- Cytotoxic drugs (residues or outdated).
- Toxic laboratory chemicals other than mercury.

Waste that may be incinerated:

- Patient contaminated non-plastics and non-chlorinated plastics.

Waste that should not be incinerated:

- Chlorinated plastics.
- Volatile toxic wastes such as mercury.

- Plastics, non-plastics contaminated with blood, body fluids, secretions. and excretions and infectious laboratory wastes.
- Radioactive waste (should be dealt with according to national laws).

PERSONAL HYGIENE

All staff must maintain good personal hygiene. Nails must be clean and kept short. Hair must be worn short or pinned up. Beard and moustaches must be kept trimmed short and clean.

HAND WASHING

Appropriate hand washing can minimize micro-organisms acquired on the hands by contact with body fluids and contaminated surfaces. Hand washing breaks the chain of infection transmission and reduces person-to-person transmission[80, 81].

Hand washing is the simplest and most cost effective way[82] of preventing the transmission of infection and thus reducing the incidence of health care associated infections.

All health care personnel and family care givers of patients must practise effective hand washing. Patients and primary care givers need to be instructed[83] in proper techniques and situations for hand washing.

TYPES OF HAND WASHING

HAND WASHING

Hand washing is usually limited to hands & wrists. The hands are washed for a minimum of 10 – 15 seconds with soap (plain or antimicrobial) & water.

HAND ANTISEPSIS/DECONTAMINATION[87, 88]

Hand antisepsis removes or destroys transient micro-organisms and confers a prolonged effect. It may be carried out in one of the following two ways:

- Wash hands and forearms with antimicrobial soap and water, for 15-30 seconds (following manufacturer's instructions).
- Decontaminate hands with a waterless, alcohol based hand gel or hand rub for 15-30 seconds. This is appropriate for hands that are not soiled with protein matter or fat.

Immersion of hands in bowls of antiseptics is not recommended.

SURGICAL HAND ANTISEPSIS

Surgical hand antisepsis removes or destroys transient micro-organisms and confers a prolonged effect.

- The hands and forearms are washed thoroughly with an antiseptic soap for a minimum of 2-3 minutes.
- The hands are dried using a sterile towel.

Surgical hand antisepsis is required before performing invasive procedures

MATERIALS USED FOR HAND WASHING/HAND ANTISEPSIS[84]

1. Soap: Plain or antimicrobial soap depending on the procedure.
2. Plain soap: Used for routine hand washing, available in bar, powder or liquid form.
3. Specific antiseptics recommended for hand antisepsis:

- 2%-4% chlorhexidine
- 5%-7.5% povidone iodine
- 1% triclosan
- 70% alcoholic hand rubs

Waterless, alcohol based hand rubs[85, 90, 91] with antiseptic and emollient gel and alcohol swabs, which can be applied to clean hands.

FACILITIES FOR DRYING HANDS

Disposable towels, reusable single use towels or roller towels, which are suitably maintained, should be available. If there is no clean dry towel, it is best to air dry hands[86].

CLOTHING

WORKING CLOTHES[74]

Staff can normally wear a personal uniform or street clothes covered by a white coat. In special areas such as intensive care units, uniform trousers and a short sleeved gown are required for men and women. The working outfit must be made of a material easy to wash and decontaminate. If possible, a clean outfit should be worn each day.

SHOES[74]

In aseptic units and in operating rooms, staff must wear dedicated shoes, which must be easy to clean.

CAPS[74]

In aseptic units, operating rooms, or performing selected invasive procedures, staff must wear caps or hoods which completely cover the hair.

MASKS [74]

Masks of cotton wool, gauze, or paper are ineffective. Paper masks with synthetic material for filtration are an effective barrier against micro-organisms. Masks are used in various situations; mask requirements differ for different purposes.

GLOVES[74]

- Hands must be washed when gloves are removed or changed.
- Disposable gloves should not be reused.
- Latex or polyvinyl chloride is the materials mostly used for gloves.
- Gloves should be selected according to need (e.g., sterile for procedures using aseptic technique such as insertion of central venous catheter and non-sterile for procedures such as emptying urinary drainage bags, insertion of peripheral IV catheters, contact with contaminated surfaces or equipment).
- Change gloves and decontaminate hands, as above:
    - Between contacts with different patients.
    - After handling respiratory secretions or objects contaminated with secretions from one patient.
    - Before contact with another patient, object, or environmental surface.

- Between contacts with a contaminated body site and the respiratory tract of, or respiratory device on, the same patient.

CARE OF HEALTH CARE WORKERS

Health care workers (HCW) are at risk of acquiring infection through occupational exposure[74, 92]. Hospital employees can also transmit infections to patients and other employees. Employees' health should be reviewed at recruitment, including immunization history and previous exposures to communicable diseases (e.g. tuberculosis) and immune status. Some previous infections such as varicella-zoster virus may be assessed by serological tests. Immunization recommended for staff includes: hepatitis A and B, influenza, measles, mumps, rubella, tetanus, and diphtheria. Immunization against varicella, rabies may be considered in specific cases. The Mantoux skin test will document a previous tuberculosis (TB) exposure.

EXPOSURE TO HUMAN IMMUNODEFICIENCY VIRUS (HIV)

The risk of a health care worker acquiring HIV after a needle stick or other "sharps" injury is less than 0.5%. Risk reduction must be undertaken for all blood borne pathogens, including adherence to standard precautions[93,94] using personal protective equipment and appropriate use of safety devices and a needle disposal system to limit sharps exposure. Training for health care workers in safe sharps practice should be ongoing[95]. Information on preventive measures must be provided to all staff with potential exposure to blood and blood products[96]. Policies which are in keeping with the local and national

guidelines must include screening of patients, disposal of sharps and wastes, protective clothing, managing inoculation accidents, sterilization and disinfection. Post exposure prophylaxis[97] should be started as per local or national guidelines.

EXPOSURE TO HEPATITIS B VIRUS[98]

Following standard precautions is important, but immunization[99] is the best way of preventing transmission to health care staff. All HCWs at risk must be vaccinated. Staff infected with blood borne pathogens may transmit these infections to patients and require careful evaluation with respect to their duties. This status should not be used as cause for discrimination.

EXPOSURE TO HEPATITIS C VIRUS

The route of infection is mainly parenteral. Sexual transmission does occur but is far less frequent. No post exposure therapy is available[100] for hepatitis C, but seroconversion (if any) must be documented. As for hepatitis B viral infection, the source person must be tested for HCV infection. For any occupational exposure to blood borne pathogens, counselling and appropriate clinical and serological follow-up must be provided.

TUBERCULOSIS

Health care workers have varying risks for exposure to tuberculosis (TB). Health care workers at the greatest risk of exposure[94] are those working in TB risk areas such as medical wards, chest clinics, bronchoscopy units, radiology units, TB laboratories, HIV wards and autopsy rooms. If a staff member has

been exposed to TB, they should report to the Infection Control Practitioner or the Staff Health Nurse depending on the hospital protocol for health care worker exposures.

SHARP INJURIES

Needle stick injuries are the most common of sharps injuries[101], although other contaminated sharp instruments may also cause injuries. All health care workers with potential exposure should be vaccinated. For other personnel, the risk of hepatitis B, hepatitis C and HIV infection should be assessed and appropriate immunization or chemoprophylactic steps taken. Immediate treatment of such injuries should encourage washing thoroughly with running water and an antiseptic solution. An incident reporting system should be in place[102]. It should not be seen as punitive; active support by managers should encourage prompt and accurate reporting.

SAFE INJECTION PRACTICES[103]

To prevent transmission of infections between patients with injections:

- Eliminate unnecessary injections
- Use sterile needle and syringe
- Use disposable needle and syringes, if possible
- Prevent contamination of medications
- Follow safe sharps disposal practices

PATIENT CARE EQUIPMENT

Reprocessing & patient care practices for specialized equipment in the ICU[72].

EQUIPMENT & PATIENT CARE ARTICLES	REPROCESSING METHOD
1. Ventilatory circuits	• Disposable tubing does not routinely need to be changed for a single patient unless it becomes visibly contaminated, malfunctions or within 3-4 days. • Multiple use tubing must be heat disinfected for at least 76°C for 30 minutes or sterilized (see manufacturer's guidelines). • The use of non-disinfected tubing between patients increases the risk of chest infection due to gram-negative bacilli, e.g. *Pseudomonas aeruginosa*. • If properly maintained, a ventilated patient may use the same circuit for 3-4 days before reprocessing becomes necessary. • When cost-effective and unless medically contraindicated, use a heat-moisture exchanger (HME) to prevent pneumonia in a patient receiving mechanically assisted ventilation. Change the HME when it malfunctions mechanically or becomes visibly soiled. • Do not *routinely* change a HME more frequently than every 48 hours. Install filters, e.g. heat-moisture exchangers with filters (HMEF) on the expiratory and inspiratory ends of the ventilator to prevent contamination.
2. Endotracheal suction catheters	• Closed suction catheters that incorporate a protective sleeve do not need to be changed every 24 hours. Studies have demonstrated that these can safely be used on the same patient

EQUIPMENT & PATIENT CARE ARTICLES	REPROCESSING METHOD
	until the device is contaminated or malfunctions. • More often, disposable suction catheters are used for respiratory tract suctioning. This device should be discarded after each use or may be used maximum for up to 6 hours on the same patient. • The water used for flushing the catheter after each suction must be sterile and changed every time.
3. Endotracheal tubes	• These may be recycled after thorough cleaning and autoclaving. • Disposable endotracheal tubes are better.
4. Ambu-bags	• Ambu-bags are extremely difficult to disinfect and become contaminated very quickly. • Heat is the most reliable method of disinfection; 2% glutaraldehyde is a less acceptable method. • The bags must be rinsed thoroughly in sterile water after immersion in glutaraldehyde. This will reduce the risk of chemical irritation, which can itself precipitate respiratory infection.
5. Oxygen delivery masks	These can be disposable or reusable; • Wash thoroughly. • Soak in alcohol for 10 minutes or soak in chlorine (500 ppm), rinse, dry and store.
6. Suction & drainage bottles	These are usually disposable, with a self-sealing inner

EQUIPMENT & PATIENT CARE ARTICLES	REPROCESSING METHOD
	container held in a clear plastic outer container. ***Non-disposable bottles*:** • Before buying a system, ensure that the outer container can be heat disinfected or autoclaved. • Must be changed every 24 hours (or sooner if full). • The contents may be emptied down in the toilet. • Must be rinsed and autoclaved. • If sterilizing facilities are not available, wash thoroughly, dry and perform high level disinfection. • Recyclable connector tubing should be cleaned thoroughly and sterilized. The system must be closed and risk to staff from body fluids should be minimal.
7. Resuscitaires	• Disconnect all connections. • Wash thoroughly with a soft brush and autoclave.\

PROCEDURES REQUIRING ASEPTIC TECHNIQUE

INTRAVASCULAR DEVICE[104,105,106]

INSERTION

a) Clean injection ports with 70% alcohol or an iodophor before accessing the system. Cap all stopcocks when not in use.

b) Use aseptic technique including a cap, mask, sterile gown, sterile gloves, and a large sterile sheet for the insertion of central venous catheters (including PICCs) or guide wire exchange.

c) After insertion, the area surrounding the catheter (introducer) will be cleansed with povidone iodine or chlorhexidine.

d) Apply a sterile transparent adhesive dressing to cover the insertion site.

e) Note down the date and time of insertion of the catheter.

CARE AND MAINTENANCE

All insertion sites will be evaluated daily (SOS) for the continued need for the device, signs/symptoms of infection, and the response to evidence of infection. Such evaluation will be documented in the patient chart. Dressings will be changed regularly.

DURATION OF THE IV DEVICES

1. CENTRAL CANNULA:

a) All central cannulas shall be removed when no longer medically indicated or if they are strongly suspected of causing sepsis.

b) On the 7^{th} consecutive day (and intervals thereafter) of an individual catheter via the same access, the physician shall evaluate the insertion site and catheter and assess the continued need for the same, and document in the notes of the patient's chart that the catheter is still medically indicated and the absence or presence of signs of sepsis.

c) Pulmonary artery catheters must be removed or changed after 5 days.

2. PERIPHERAL CANNULA:

a) Peripheral IV access devices should be replaced every 72 hours.

REMOVAL OF IV DEVICES

a) Guide wire assisted catheter exchange may be used to replace a malfunctioning catheter or to convert an existing catheter if there is no evidence of infection at the catheter site. Attire and antiseptic technique should parallel that of insertion.

b) If catheter related sepsis is suspected, but there is no evidence of local catheter related infection (e.g., purulent drainage, erythema, tenderness) the catheter may be changed over a guide wire.

c) Do not use guide wire assisted catheter exchange whenever catheter related infection is documented. If the patient requires continued vascular access, remove the implicated catheter and replace it with another catheter at different insertion site.

URINARY CATHETER: [107,108,109]

- Avoiding urethral catheterization unless there is a compelling indication limiting the duration of drainage, if catheterization is necessary.
- Maintaining appropriate aseptic practice during urinary catheter insertion and other invasive urological procedures (e.g. cystoscopy, urodynamictesting, cystography).

- Hygienic hand wash or rub prior to insertion and following catheter or drainage bag manipulation.
- Sterile gloves for insertion.
- Perineal cleaning with an antiseptic solution prior to insertion.
- Non-traumatic urethral insertion using an appropriate lubricant.
- Maintaining a closed drainage system.

Other practices which are recommended, but not proven to decrease infection include:

- Maintaining good patient hydration.
- Appropriate perineal hygiene for patients with catheters.
- Appropriate staff training in catheter insertion and care.
- Maintaining unobstructed drainage of the bladder to the collection bag, with the bag below the level of the bladder.
- Generally, the smallest diameter catheter should be used. Catheter material (latex, silicone) does not influence infection rates.
- For patients with a neurogenic bladder:
    - Avoid an indwelling catheter if possible.
    - If assisted bladder drainage is necessary, clean intermittent urinary catheterization should be used.

RESPIRATORY CARE

- If there is no medical contraindication, elevate the head of the bed of a patient at high risk for aspiration pneumonia e.g., a person receiving

mechanically assisted ventilation and/or who has an enteral tube in place, at an angle of 30-45 degrees.

- Periodically drain and discard any condensate that collects in the tubing of a mechanical ventilator, taking precautions not to allow condensate to drain toward the patient.
- If available, use an endotracheal tube with a dorsal lumen above the endotracheal cuff to allow drainage (by continuous suctioning) of tracheal secretions that accumulate in the patient's subglottic area.
- Use sucralfate, H2-blockers, and/or antacids interchangeably for stress bleeding prophylaxis in a patient receiving mechanically assisted ventilation (H2-blockers alone decrease gastric acidity and increase gastric colonization and increases the susceptibility to respiratory infections).

MATERIALS AND METHODS

STUDY DESIGN

- Retrospective and Prospective Prevalence study

STUDY CENTRE

- Intensive Medical Care Unit
- Government General Hospital, Chennai

SELECTION OF PATIENTS

1. INCLUSION CRITERIA

- Patients with negative baseline cultures at the time of admission.
- Health care professional who are not incubating any infection at the time of study.
- Inanimate objects present in the intensive care units.

2. EXCLUSION CRITERIA

- All infected and septicemic patients at the time of admission are excluded from the study

3. SAMPLE SIZE

- Cultures from the environment, health care providers are taken weekly from critical care area.
- Cultures are taken from patients in critical care area who fulfill the inclusion criteria with sample size of 200

MATERIALS AND METHODS

Phase I:

- ✓ Analysis of case sheets

Phase II:

- ✓ Uricol bottle
- ✓ Tracheal aspirate sample containers
- ✓ Blood culture bottle
- ✓ Ames swabs
- ✓ Culture media

Phase III:

- ✓ Uricol bottle
- ✓ Tracheal aspirate sample containers
- ✓ Blood culture bottle
- ✓ Ames swabs
- ✓ Culture media
- ✓ Aprons, caps, masks, slippers
- ✓ Running water and soap
- ✓ Antiseptic lotion

METHODOLOGY

We started the study with Phase I and we retrospectively analysed the bateriologic profile in the past three months in order to know about the pattern

of organisms prevalent before the study .The study was then further spread over two phases of three months each, Phase II and Phase III**.** In the Phase II of our study i.e., during the first three months, the regular ward routine were not disturbed and no new specialized preventive measure was introduced. The nursing staff continued to attend to their patients as per routine. Ward disinfection routine continued as before and waste disposal was carried out as per the standard policy of the hospital. Bacterial flora of ICU was monitored by weekly cultures from wall, floor, and other patient contact items like bed, oxygen giving masks, nasal catheters and antiseptic in use lotions (table below).

ICU ENVIRONMENT	**PATIENT**	**STAFF**
Wall	Urine if catheterized	Swabs from palms
Floor	Blood samples	Nail bed
Air settle plates	Tracheal swabs	
Beds	**If necessary:**	
Ventilator tubing	Suction catheter tip with aspirate	
Oxygen masks	CVP cath tip	
Nasal catheters	Intra cath tip	
Antiseptic inuse lotion	Wound swabs	
Linen/dress	Tracheal swabs	

Patient surveillance for nosocomial infections was done as excluding patients with sepsis by taking cultures from urine specimens if catheterised,

tracheal aspirates, blood and CVP catheter tip and intracath tips were cultured whenever changed. All the swabs were taken before any antiseptic procedure was carried out.

All the ICU staffs were educated about the aim of the study and details of the protocol to ensure their participation from time to time. The entry of the visitors was restricted to only one at a time for maximum five minutes during the visiting hours. Hand washing facilities were improved by providing running warm water and liquid soft soap near the central nursing station. The staff were explained the importance of repeated hand washing immediately before and after every episode of patient contact or nursing activity in prevention of cross infection. They were instructed to wash hands immediately before and after handling each patient in specific manner as advocated to prevent contact of washed areas with unwashed areas of hands. In the Phase III study, the bacterial monitoring of the ICU environment, surveillance of the staff and the patients was continued as in Phase II.

First category consisted of all the culture specimens taken from the different patient sites to demonstrate their infected status as they were regarded as potential source capable of harbouring and spreading the nosocomial infections. Second category consisted of ICU environment wherein all the culture specimens from ICU wall, floor, bed, linen and other patient contact equipments were included. This information was felt essential to determine the pattern of overall bacterial flora existing in ward, its potential in harbouring the

infection and also the efficacy of various existing infection control methods being followed.

The results obtained in both phases for each category were finally compared as percentage and further statistically analysed for any significant change, by using t test and P values as test of significance. Attempt was also made to link the difference in observations in both phases to the financial implications in provision of disposables for infection control programme.

DATA COLLECTION AND ANALYSIS

Collection of data: As per Performa attached.

Analysis of data: Using statistical package SPSS software

Conflict of interest: NIL

Financial support: NIL

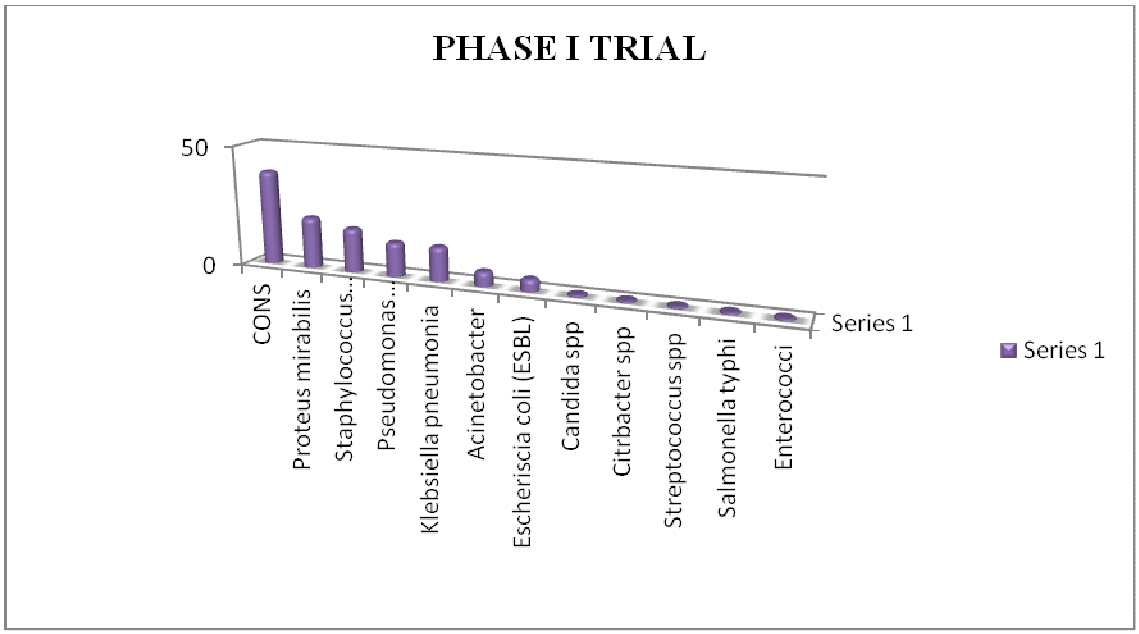
OBSERVATIONS AND RESULTS

In Phase I trial, which was carried out between the months of August to October 2010, 177 case sheets were analysed (retrospectively the bateriologic profile for these months were analysed) in order to know about the pattern of organisms prevalent before the study.

Overall estimates showed that CONS was the most common organism isolated followed by Proteus. Out of the 122 isolates gram +ve cocci were 58, gram -ve bacilli were 63, others 1.

TABLE 1. BACTERIOLOGIC PROFILE IN PHASE I TRAIL

ORGANISMS	NO. OF ISOLATES
CONS	39
Proteus mirabilis	21
Staphylococcus aureus	18
Pseudomonas aeruginosa	14
Klebsiella pneumonia	14
Acinetobacter	6
Escheriscia coli (ESBL)	5
Candida spp	1
Citrbacter spp	1
Streptococcus spp	1
Salmonella typhi	1
Enterococci	1
TOTAL	**122**



In the Phase II, trial samples were taken from different IMCU environments and from the patients, and were carried out between the months of December 2010 to February 2011.

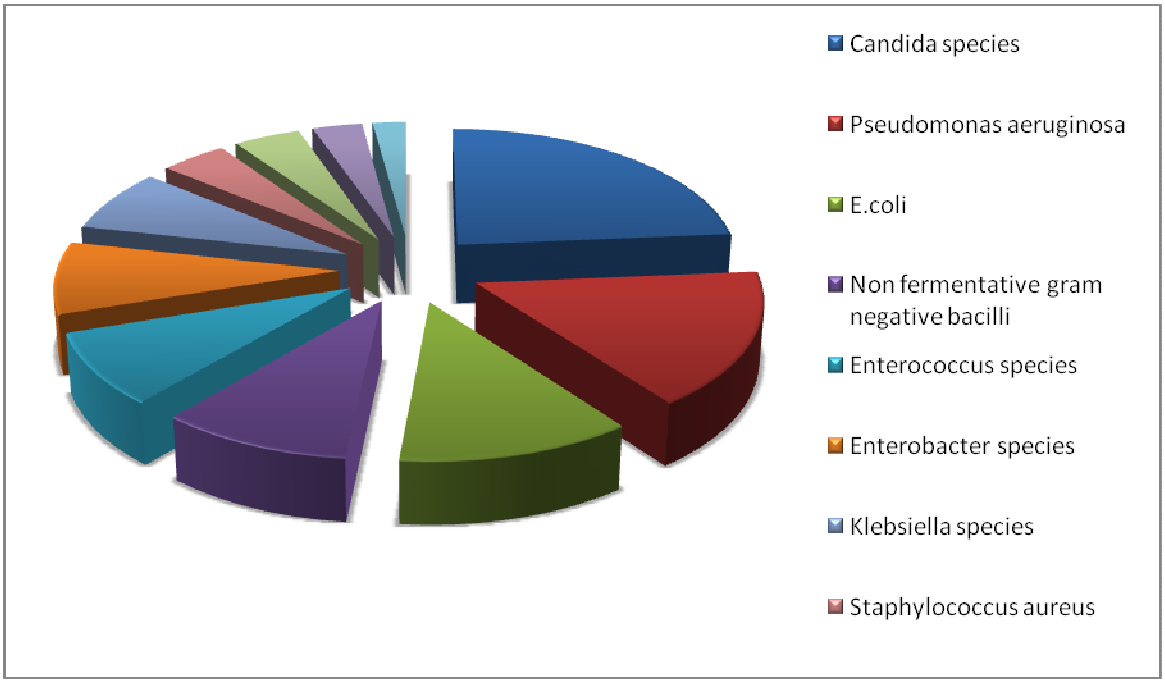
TABLE 2. TOTAL NO.OF PATIENT SAMPLES
PHASE II TRIAL

SAMPLES	NO. OF SAMPLES
Urine	**47**
Tracheal aspirate	**29**
Blood	**17**
CVP catheter tip	**02**
TOTAL	**95**

Out of the 95 samples analysed, 93 organisms were isolated from patients' samples. The most prevalent organism being *Candida spp*, followed by *Psuedomonas aureginosa.*

TABLE 3. BACTERIOLOGIC PROFILE PATIENT SAMPLE
PHASE II TRIAL

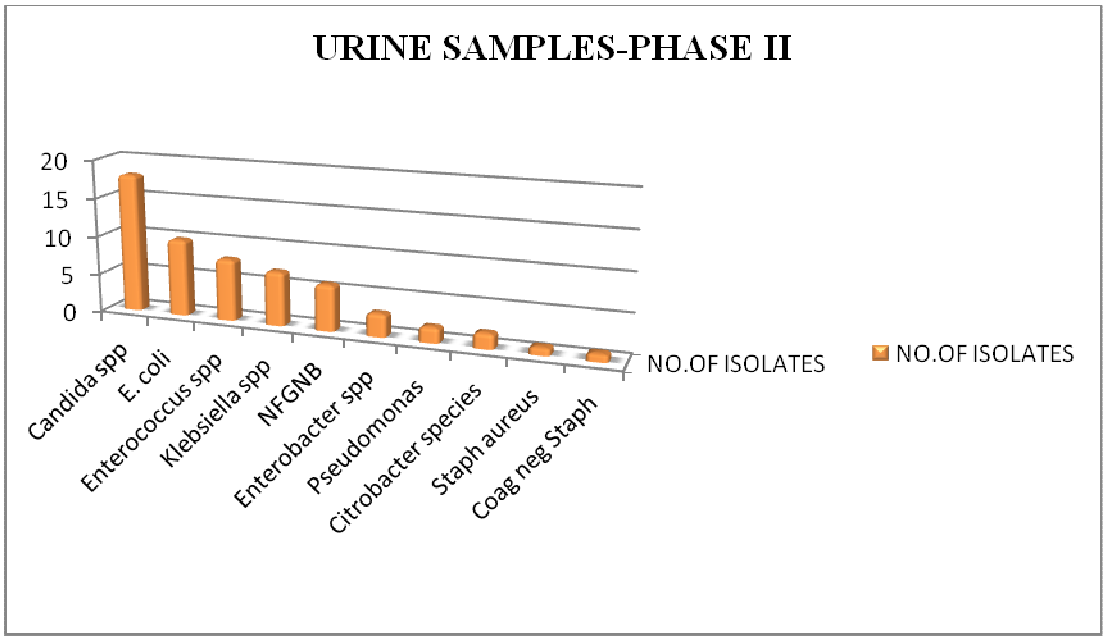
ORGANISM	NO. OF ISOLATES
Candida species	**22**
Pseudomonas aeruginosa	**15**
E.coli	**11**
Non fermentative gram negative bacilli	**9**
Enterococcus species	**8**
Enterobacter species	**8**
Klebsiella species	**7**
Staphylococcus aureus	**4**
Citrobacter species	**4**
Coagulase negative Staphylococci	**3**
Proteus species	**2**
TOTAL	**93**



Among these, out of the 47 urine samples, 59 organisms were isolated with *Candida* being the most commonly isolated organism. No growth was found in 11 samples.

TABLE 4. URINE SAMPLES - PHASE II TRIAL

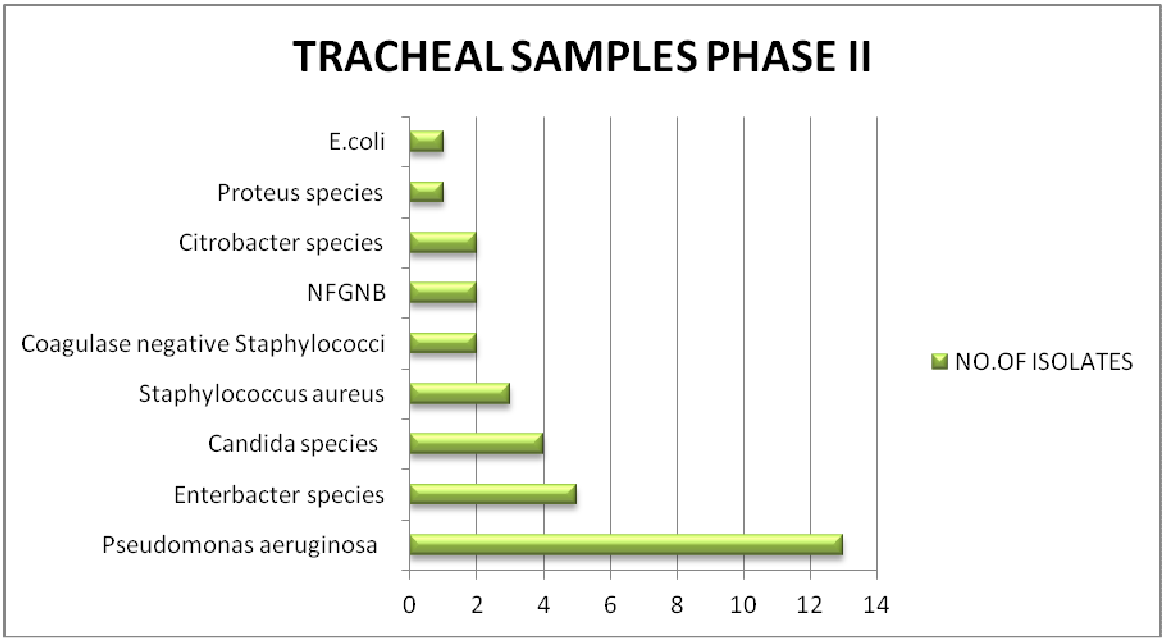
ORGANISMS	NO. OF ISOLATES
Candida species	**18**
Escherichia coli	**10**
Enterococcus species	**8**
Klebsiella species	**7**
NFGNB	**6**
Enterobacter species	**3**
Pseudomonas aeruginosa	**2**
Citrobacter species	**2**
Staphylococcus aureus	**1**
Coagulase negative Staphylococci	**1**
Proteus species	**1**
TOTAL	**59**



Out of the 29 tracheal aspirate samples, 33 organisms were isolated and were *polymicrobial. Pseudomonas aeruginosa* being the most common among them. No growth was noted in 7 samples.

TABLE 5. TRACHEAL ASPIRATE SAMPLES - PHASE II TRIAL

ORGANISMS	NO.OF ISOLATES
Pseudomonas aeruginosa	**13**
Enterbacter species	**5**
Candida species	**4**
Staphylococcus aureus	**3**
Coagulase negative Staphylococci	**2**
NFGNB	**2**
Citrobacter species	**2**
Proteus species	**1**
E.coli	**1**
TOTAL	**33**

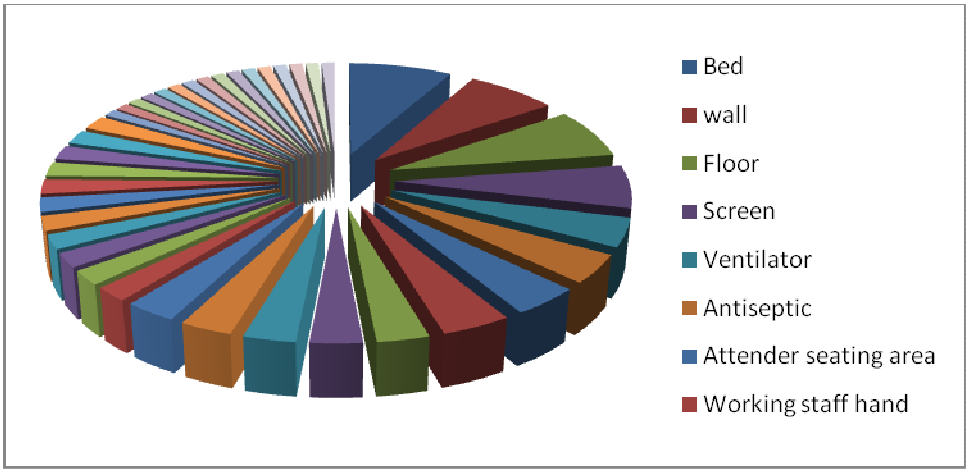


There was only one organism isolated from the blood culture samples & CVP catheter tip samples were negative. 97 environmental samples were analysed and 190 organisms were isolated.

TABLE 6. TOTAL NO.OF ENVIRONMENTAL SAMPLES PHASE II TRIAL

SAMPLE	TOTAL NO. OF SAMPLES
Bed	8
Wall	7
Floor	7
Screen	6
Ventilator	4
Antiseptic	4
Attender seating area	4
Working staff hand	4
Ventilator Stand	3
Window	3
IV stand	3
Multi Monitor	3
Cubicle Glass	3
Bed spread	2
Oxygen Mask	2
Ambu bag	2
Drug Tray	2
X-ray lobby	2
Emergency drug tray	2
Computer	2
Phone	2
Doctor's table	2
Working table	2
Pendent	2
Cubicle Tray	1
Ounce glass	1
Mortar and pestle	1
Laryngoscope	1
Circuit box	1
Feeding syringe	1
Drug table	1
Drug box	1

SAMPLE	TOTAL NO. OF SAMPLES
Door knob	1
Veranda cupboard	1
Staff room	1
Bathroom	1
Veranda	1
Veranda door	1
Wall steel rim	1
Cupboard	1
TOTAL	**97**

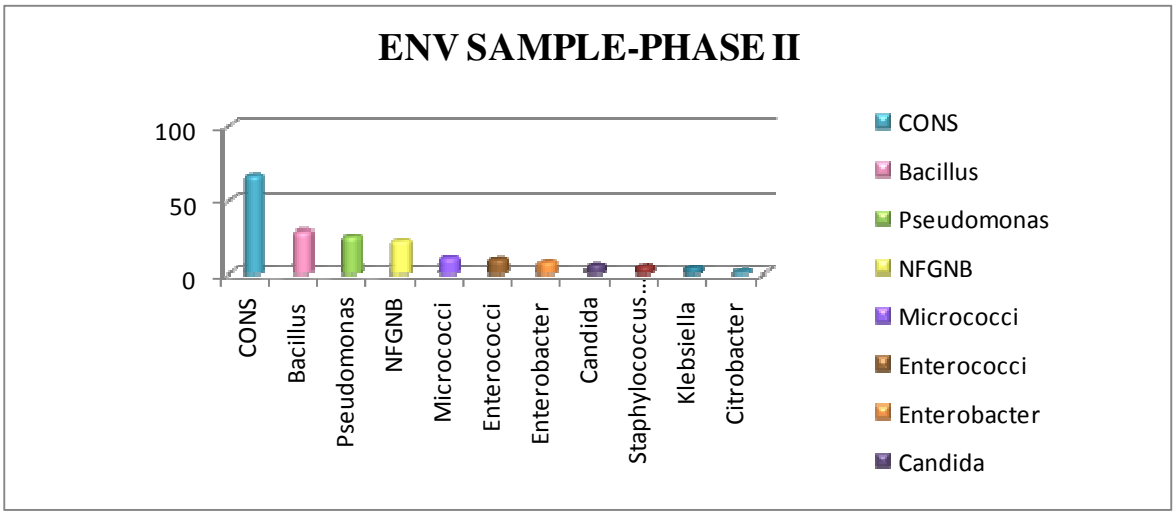


Coagulase negative Staphylococci was the most common organism isolated from the environment followed by *Bacillus spp* and *Pseudomonas aureginosa*.

TABLE 7. BACTERIOLOGIC PROFILE ENVIRONMENTAL SAMPLES PHASE II TRIAL

ORGANISM	NUMBER OF ISOLATES
CONS	66
Bacillus	29
Pseudomonas	26
NFGNB	23
Micrococci	11
Enterococci	10

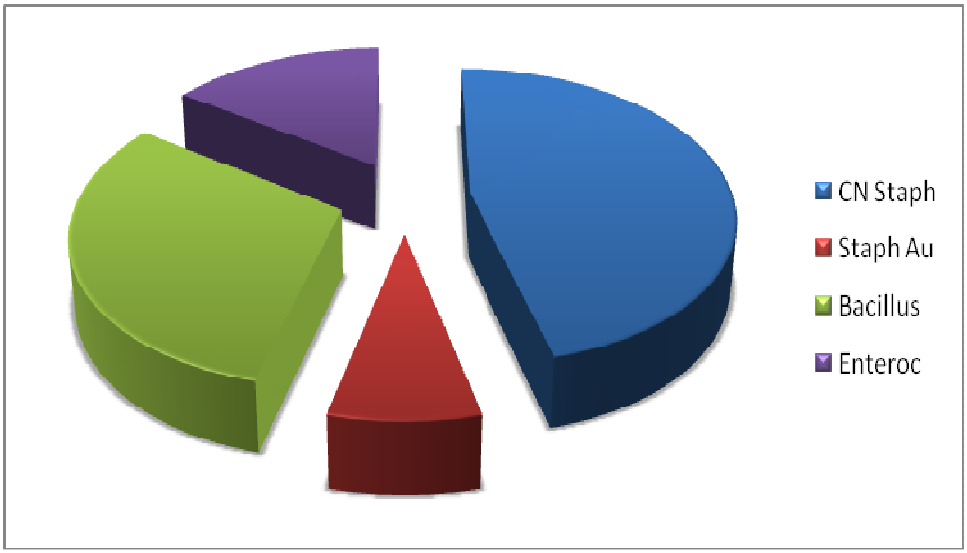
ORGANISM	NUMBER OF ISOLATES
Enterobacter	8
Candida	6
Staphylococcus aureus	5
Klebsiella	4
Citrobacter	1
E.coli	1
TOTAL	**190**



WALL

Total no of sample: 7

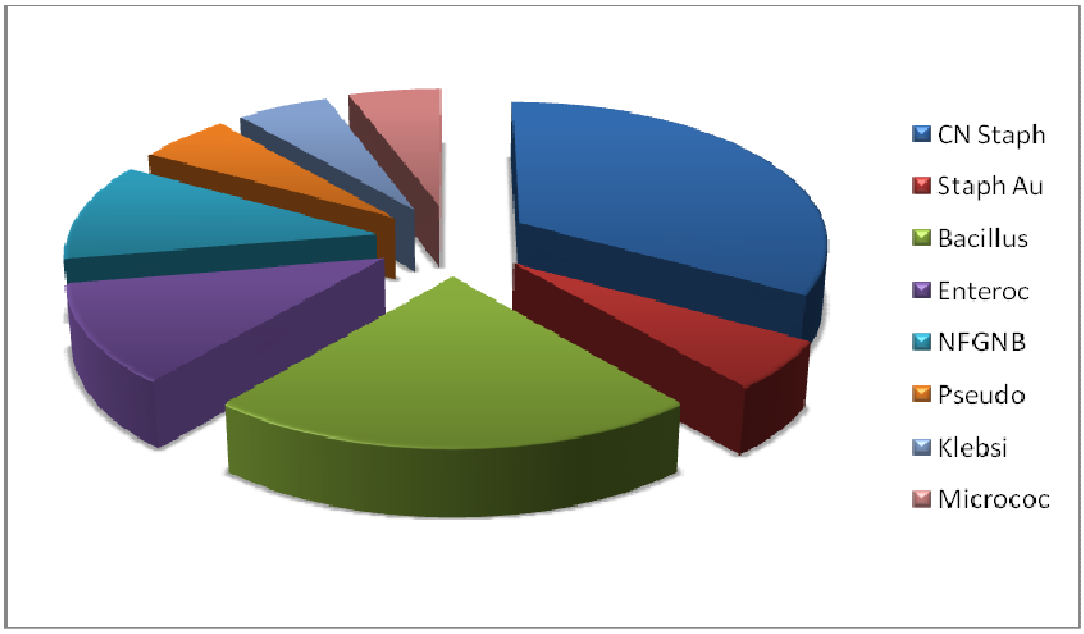
Total no of isolates: 11



FLOOR

Total no of sample: 7

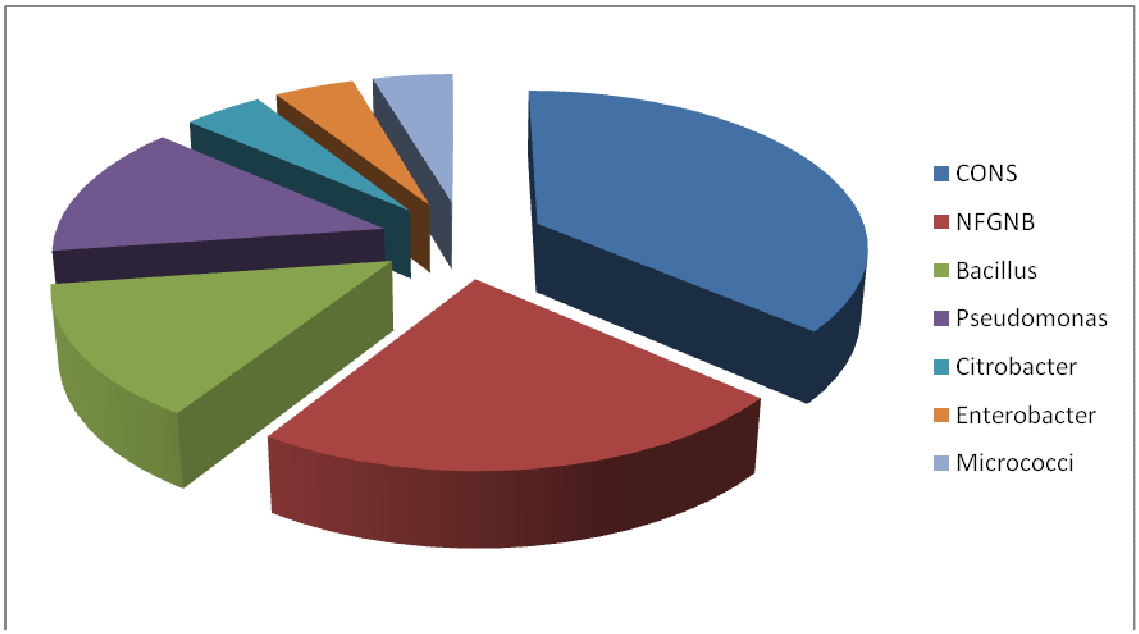
Total no of isolates: 18



BED

Total no of sample: 8

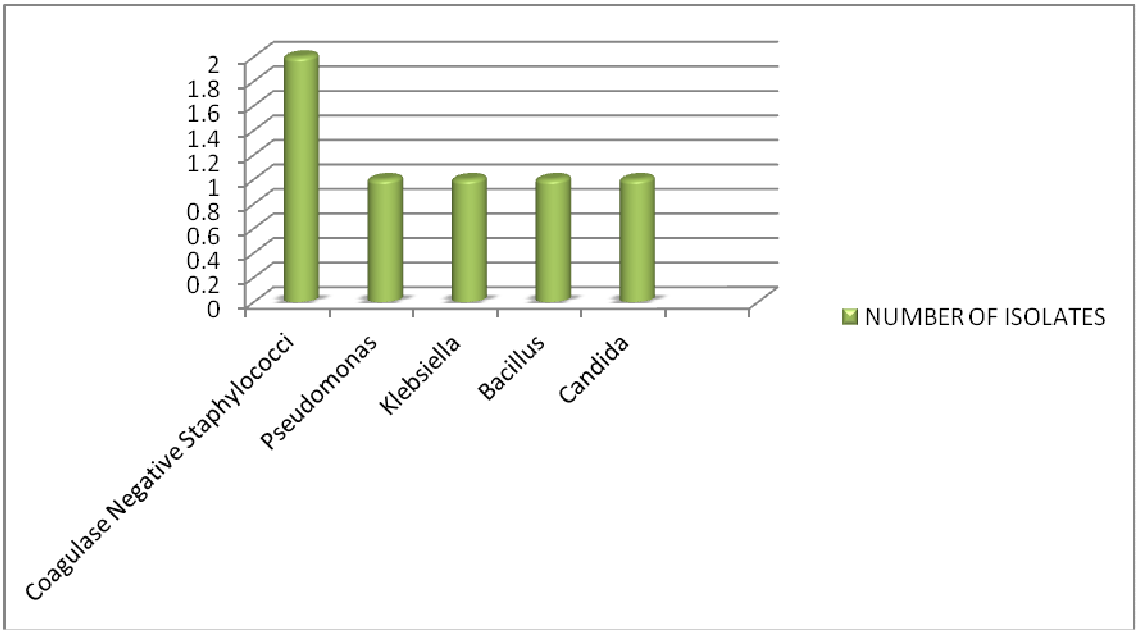
Total no of isolates: 22



VENTILATOR SAMPLE

Total no of samples: 4

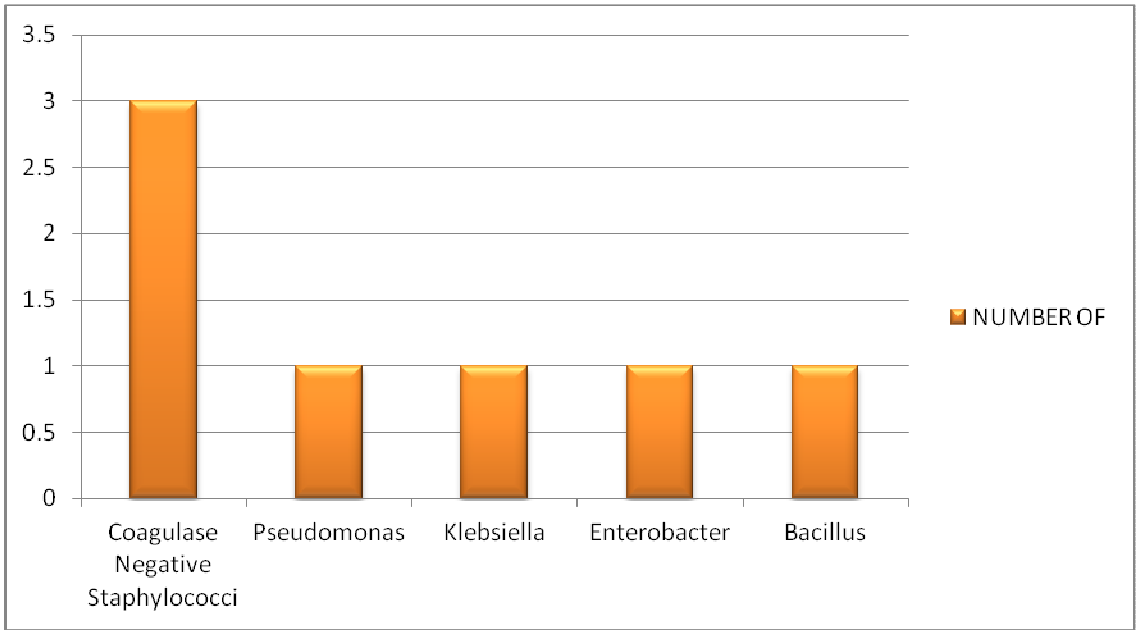
Total no of isolates: 6



VENTILATOR STAND

Total no of samples: 3

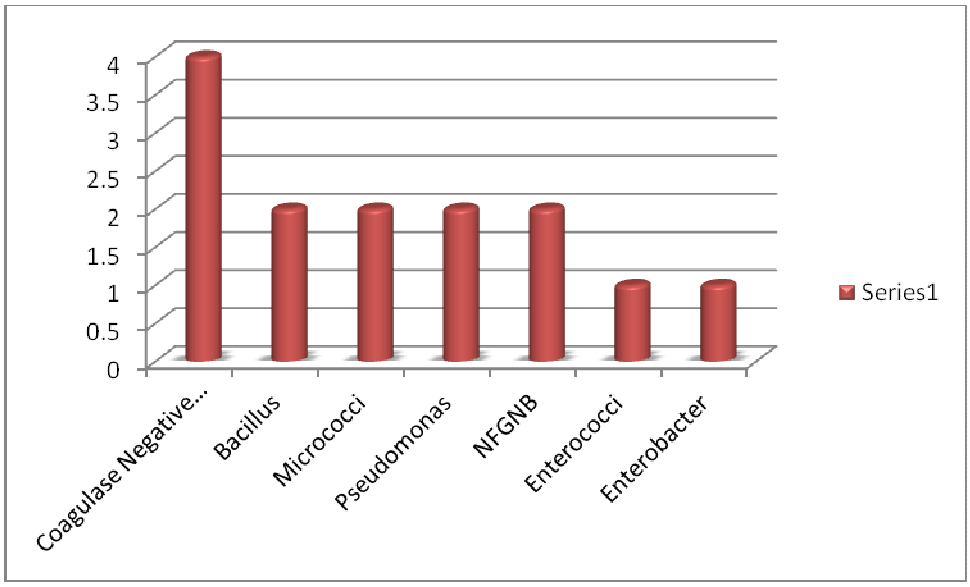
Total no of isolates: 8



SCREEN SAMPLE

Total no of samples: 6

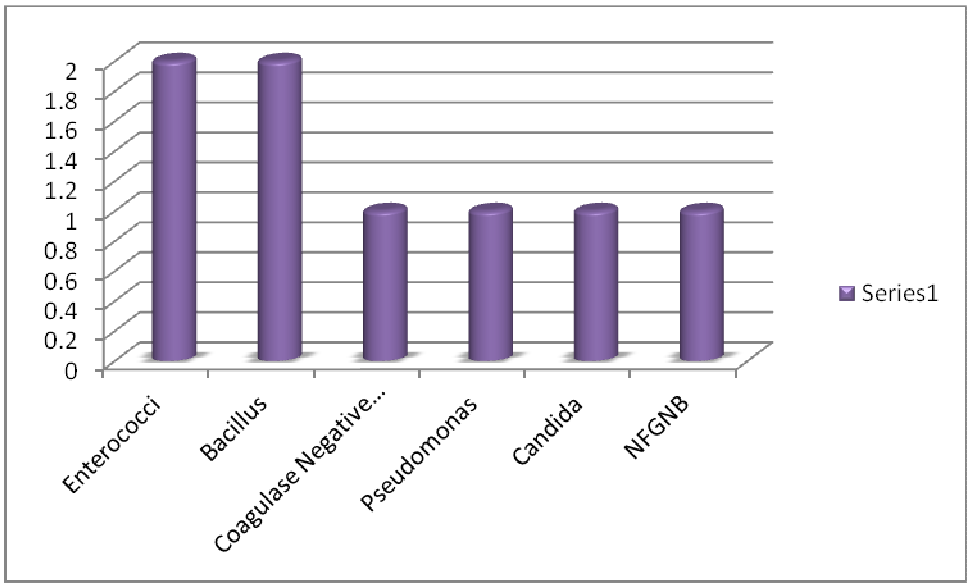
Total no of isolates: 14



BED SPREAD

Total no of samples: 2

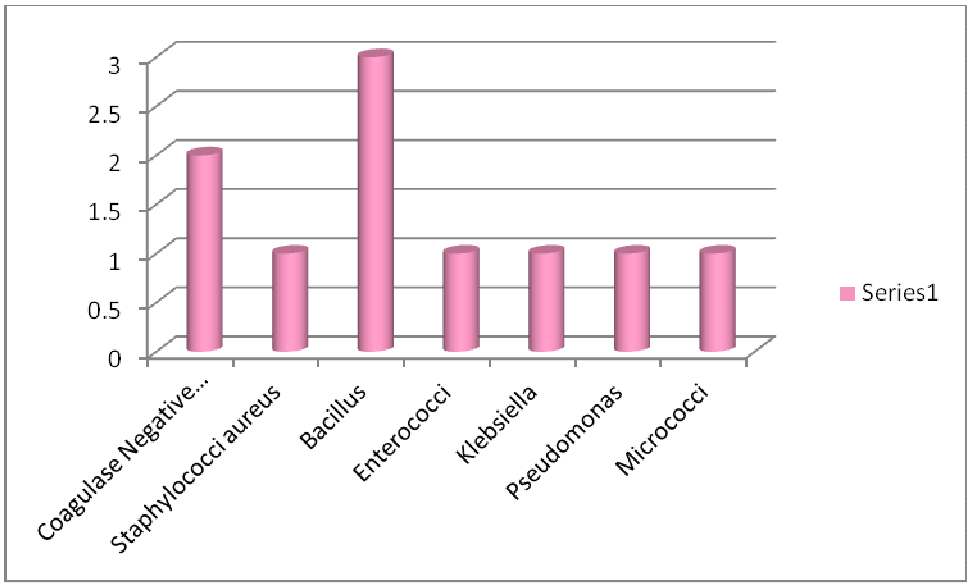
Total no of isolates: 8



ATTENDER SEATING AREA

Total no of samples: 4

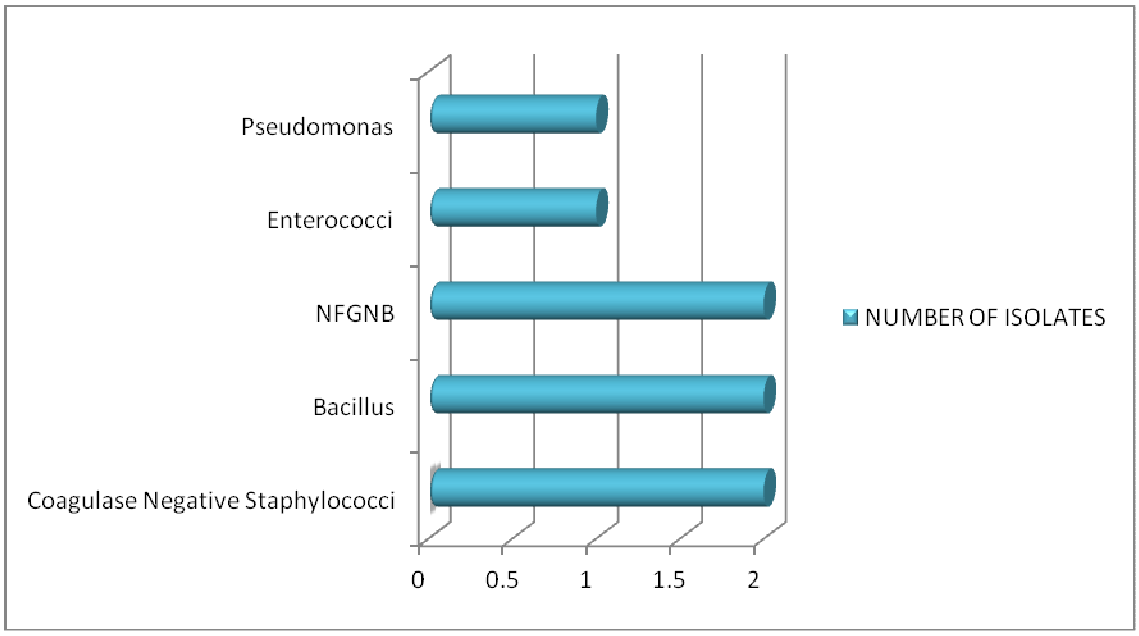
Total no of isolates: 10



CUBICLE SEPARATING GLASS

Total no of samples: 3

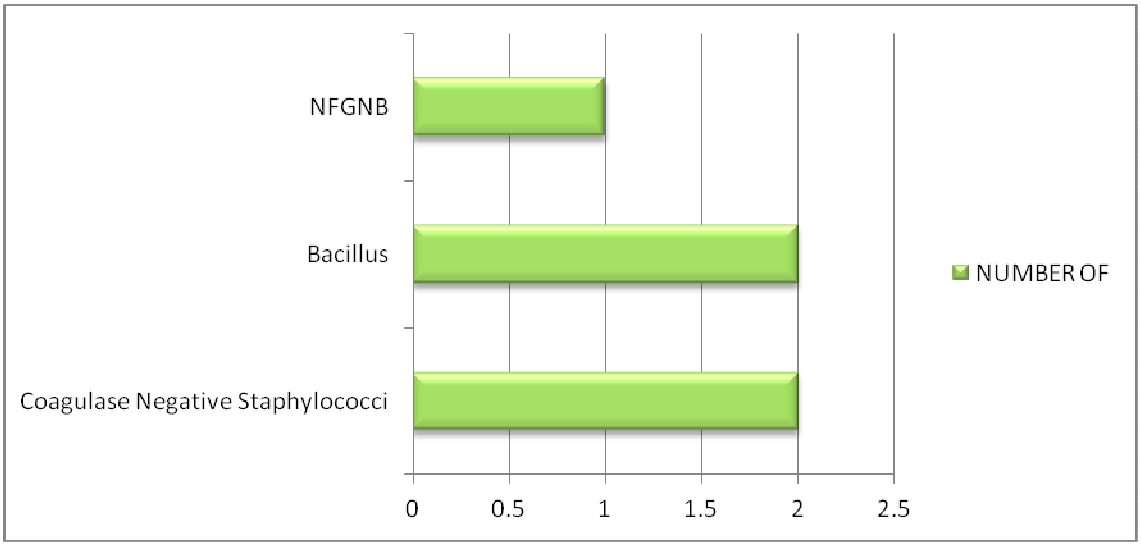
Total no of isolates: 8



WINDOWS

Total no of samples: 3

Total no of isolates: 5



In the Phase III, trial samples were taken from different IMCU environments and from the patients, and were carried out between the months of July 2011 to Sep 2011.

TABLE 8. TOTAL NO.OF PATIENT SAMPLES - PHASE III TRIAL

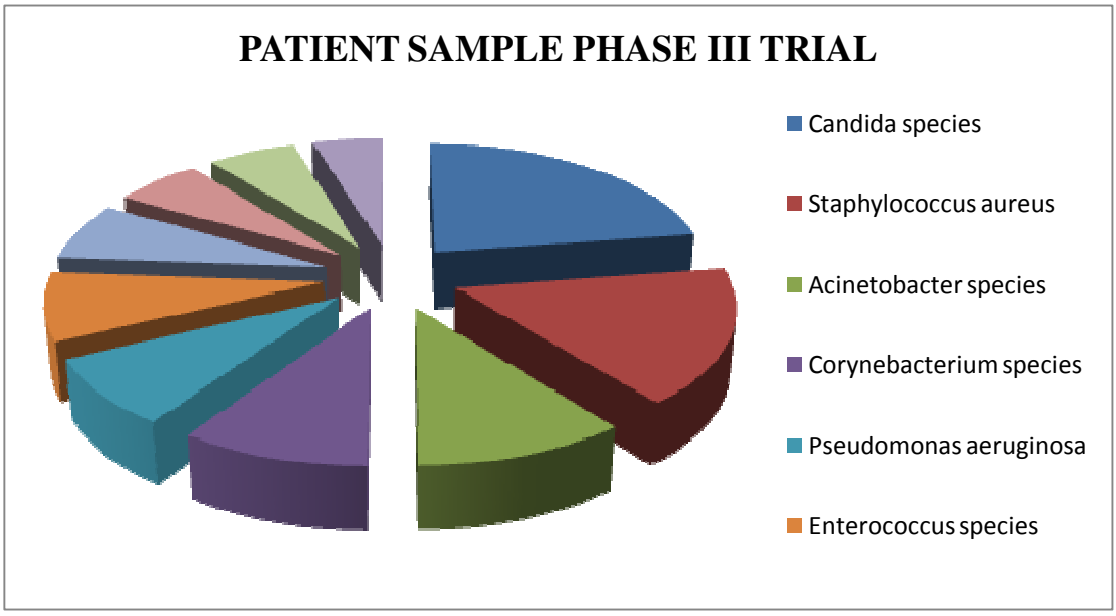
SAMPLES	NO. OF SAMPLES
Urine	**51**
Tracheal aspirate	**31**
Blood	**12**
CVP cather tip	**2**
TOTAL	**96**

Out of the 96 samples analysed, 86 organisms were isolated from patients' samples. The most prevalent organism being *Candida spp*, followed by *Staphylococcus aureus.*

TABLE 9. BACTERIOLOGIC PROFILE PATIENT SAMPLES - PHASE III TRIAL

ORGANISM	NO. OF ISOLATES
Candida species	**19**
Staphylococcus aureus	**14**
Acinetobacter species	**9**
Corynebacterium species	**8**
Pseudomonas aeruginosa	**7**

ORGANISM	NO. OF ISOLATES
Enterococcus species	**7**
Klebsiella pneumoniae	**6**
Klebsiella oxytoca	**5**
Coagulase negative Staphylococci	**5**
E.coli	**4**
Non fermentative gram negative bacilli	**2**
TOTAL	**86**

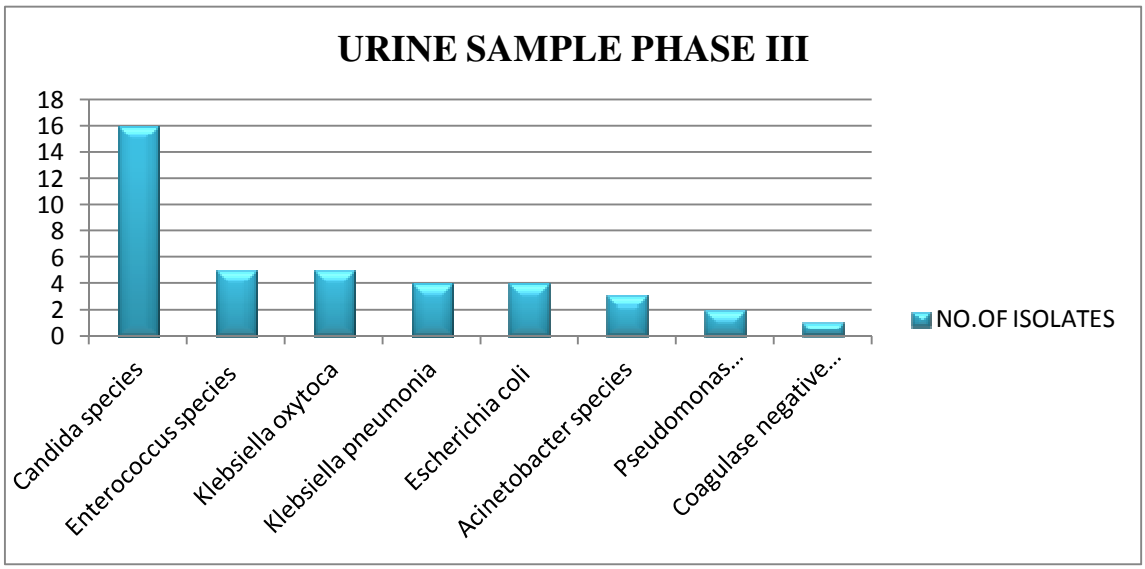


Among these, out of the 51 urine samples 40 organisms were isolated with *Candida* being the most commonly isolated organism. No growth was found in 11 samples.

TABLE 10. URINE SAMPLES - PHASE III TRIAL

ORGANISMS	NO. OF ISOLATES
Candida species	**16**
Enterococcus species	**5**
Klebsiella oxytoca	**5**
Klebsiella pneumonia	**4**

ORGANISMS	NO. OF ISOLATES
Escherichia coli	**4**
Acinetobacter species	**3**
Pseudomonas aeruginosa	**2**
Coagulase negative Staphylococci	**1**
TOTAL	**40**

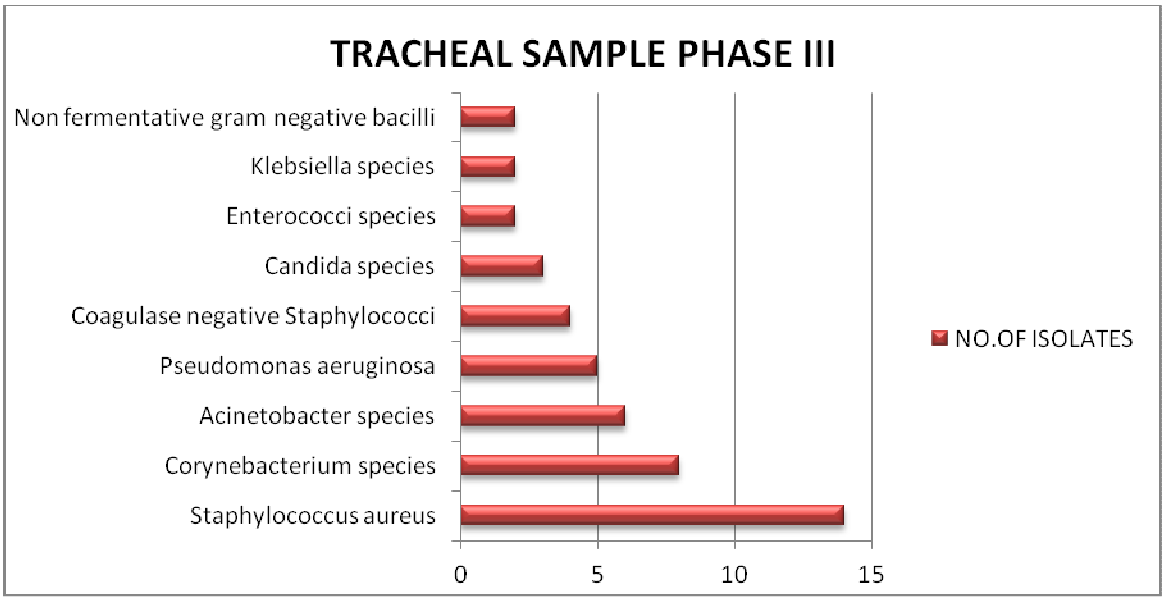


Out of the 31 tracheal aspirate samples, 46 organisms were isolated and was *polymicrobial. Staphylococcus aureus* being the most common among them. No growth was noted in 7 samples.

TABLE 11. TRACHEAL ASPIRATE SAMPLES - PHASE III TRIAL

ORGANISMS	NO.OF ISOLATES
Staphylococcus aureus	**14**
Corynebacterium species	**8**
Acinetobacter species	**6**
Pseudomonas aeruginosa	**5**

ORGANISMS	NO.OF ISOLATES
Coagulase negative Staphylococci	**4**
Candida species	**3**
Enterococci species	**2**
Klebsiella species	**2**
Non fermentative gram negative bacilli	**2**
TOTAL	**46**



There was no organism isolated from the blood culture samples & CVP catheter tip. 98 environmental samples were analysed and 178 organisms were isolated.

TABLE 12. TOTAL NO.OF ENVIRONMENTAL SAMPLES - PHASE III TRIAL

SAMPLE	NO OF SAMPLE
AMBOBAG	2
BED	10
BED SPREAD	4
BIOLOGICAL BINS	2
COMPUTER	2
CUBICLE SEPERATING GLASS	4

SAMPLE	NO OF SAMPLE
CURTAIN	4
DRUG TABLE-2	2
DRUG TRAY	4
FLOOR	10
FRIDGE INSIDE	2
GENERAL TABLE	4
IV STAND	3
MILK GLASS	3
MORTAR AND PESTLE	2
MULTI MONITOR	4
PENDENT	3
SCREEN	8
VENTILATOR OUTSIDE	2
VENTILATOR INSIDE	2
WALL	10
WINDOW	4
X RAY LOBBY	2
ANTISEPTIC	2
WORKING STAFF HAND	4
TOTAL	**98**

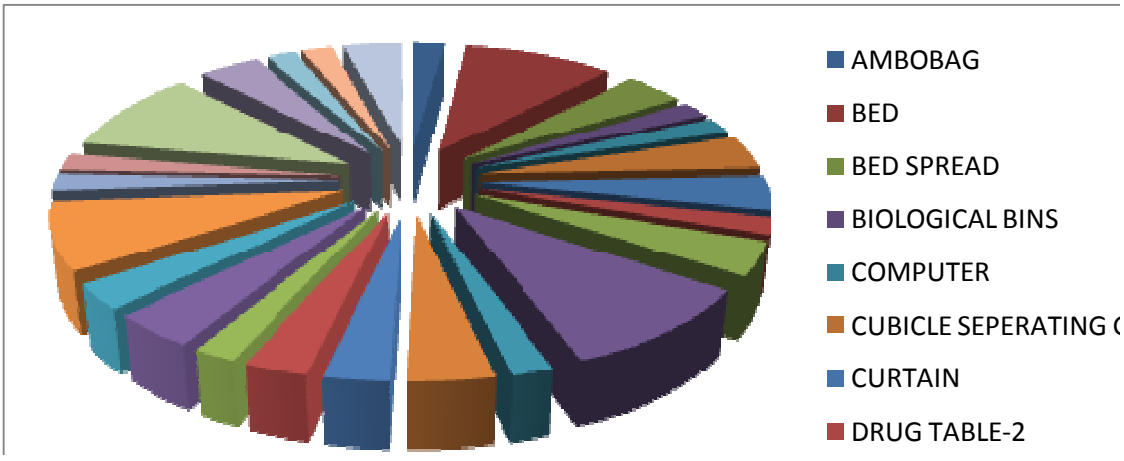
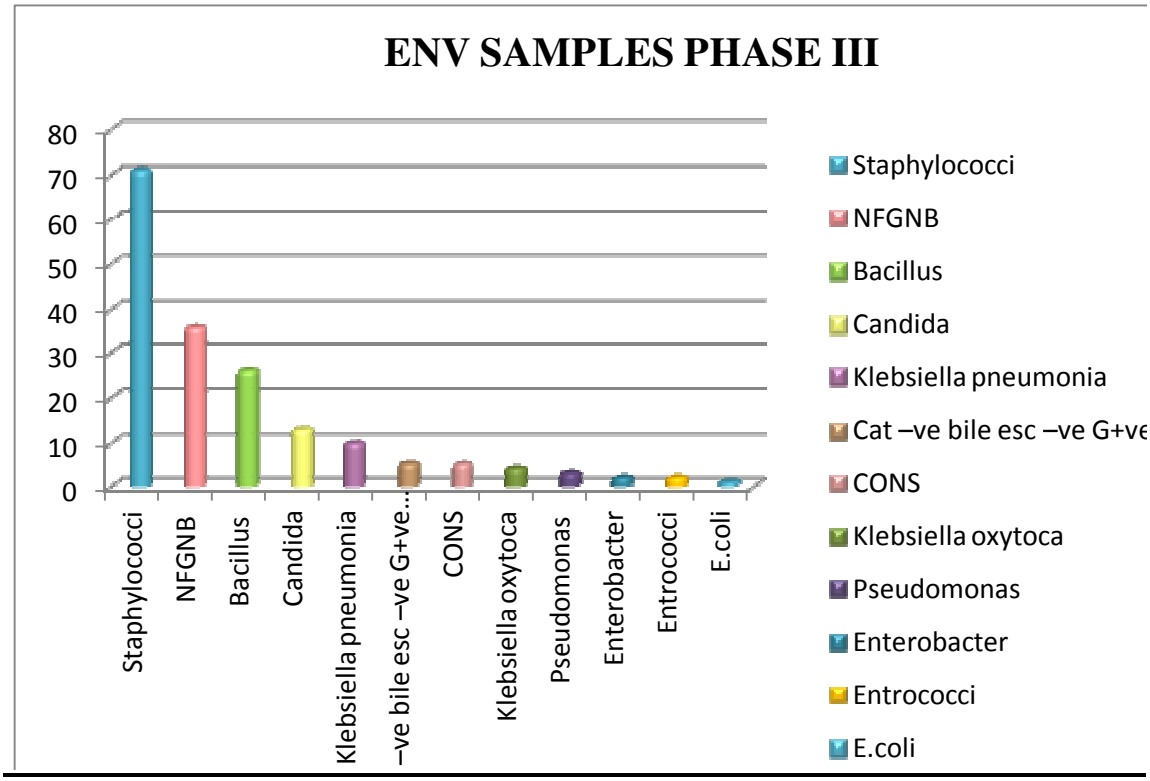


TABLE 13. BACTERIOLOGIC PROFILE ENVIRONMENTAL SAMPLES - PHASE III TRIAL

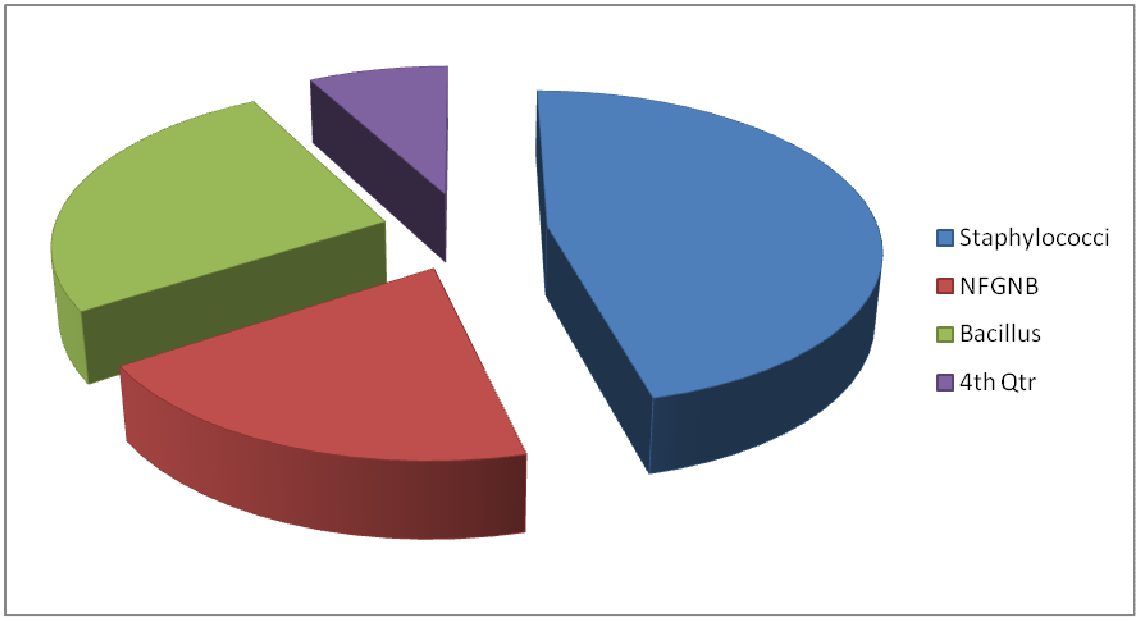
ORGANISM	NUMBER OF ISOLATES
Staphylococci	*71*
NFGNB	*36*
Bacillus	*26*
Candida	*13*
Klebsiella pneumonia	*10*
Cat –ve bile esculin –ve G+ve cocci	*5*
CONS	*5*
Klebsiella oxytoca	*4*
Pseudomonas	*3*
Enterobacter	*2*
Entrococci	*2*
E.coli	*1*
TOTAL	**178**



WALL

Total no of sample: 10

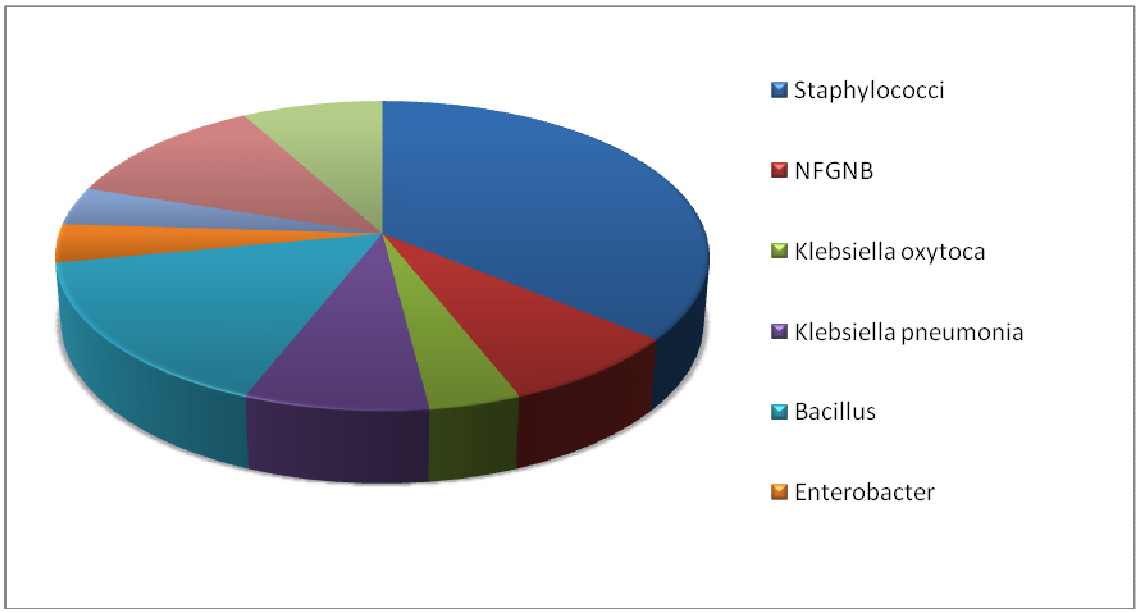
Total no of isolates: 14



FLOOR

Total no of sample: 10

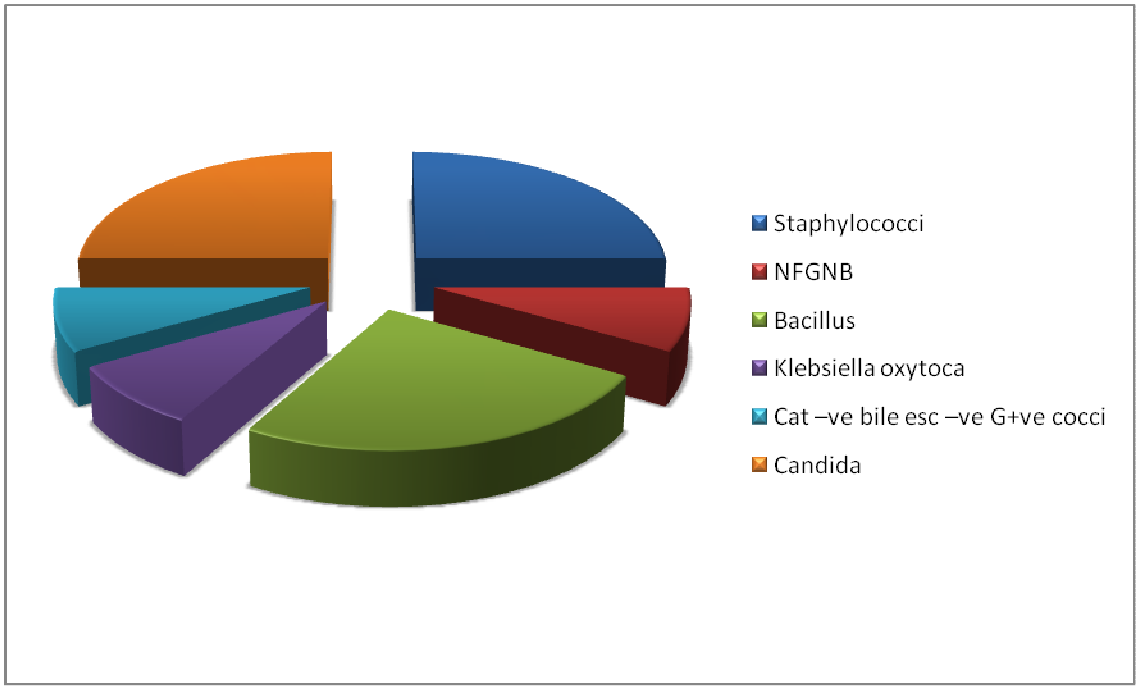
Total no of isolates: 25



BED

Total no of sample: 10

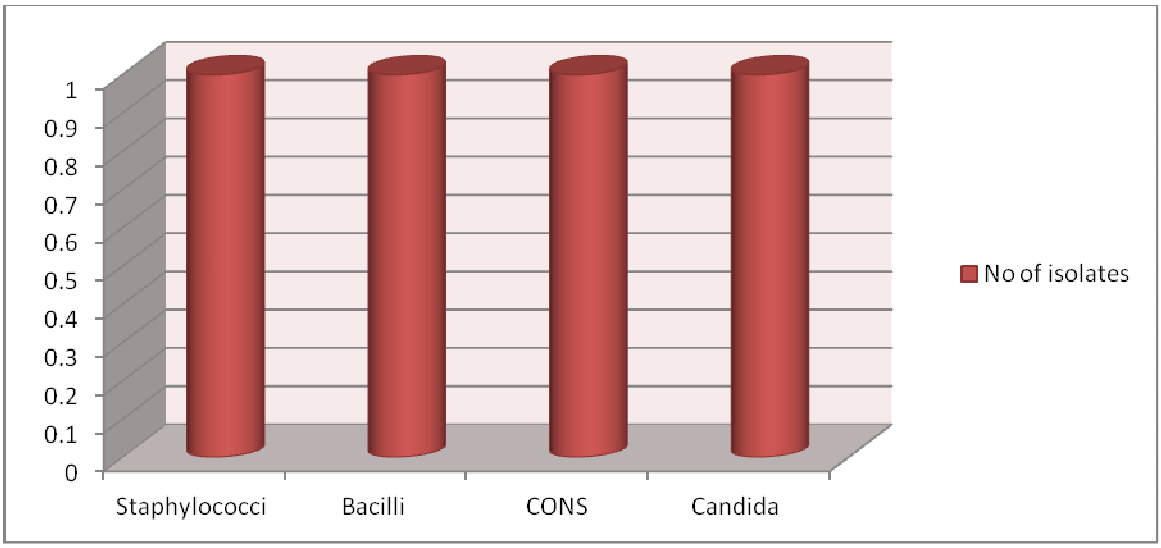
Total no of isolates: 12



BIOLOGIC BIN

Total no of sample: 2

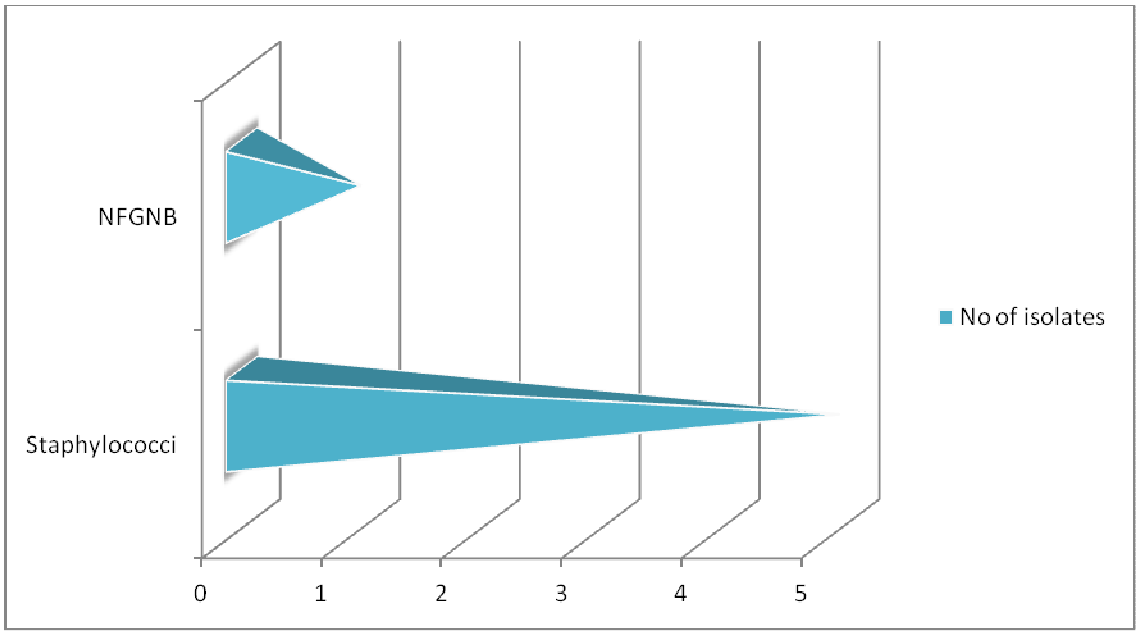
Total no of isolate: 4



DRUG TRAY

Total no of sample: 4

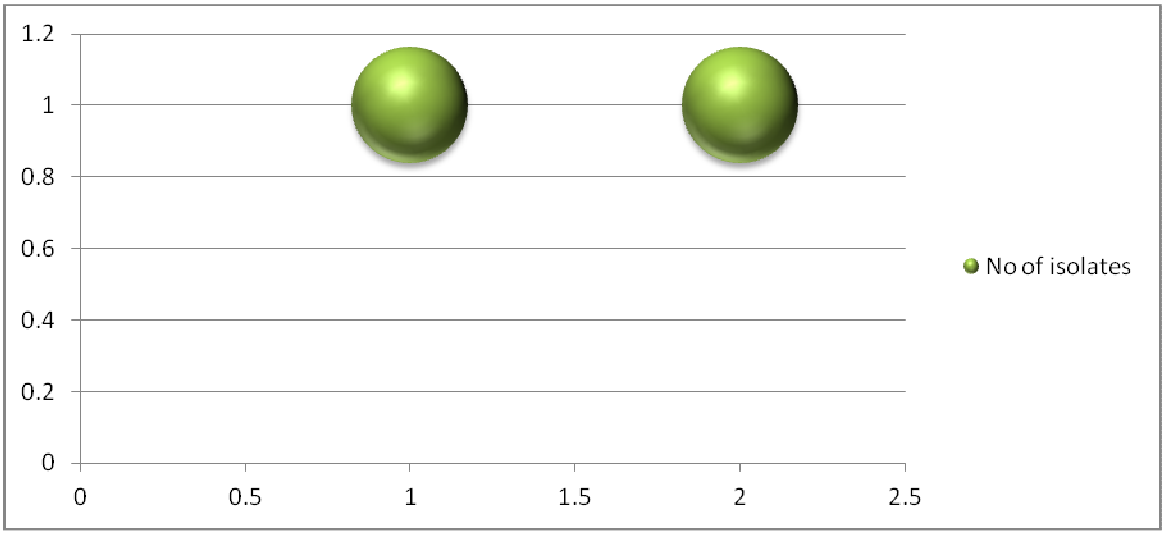
Total no of isolates: 6



FRIDGE INSIDE

Total no of sample: 2

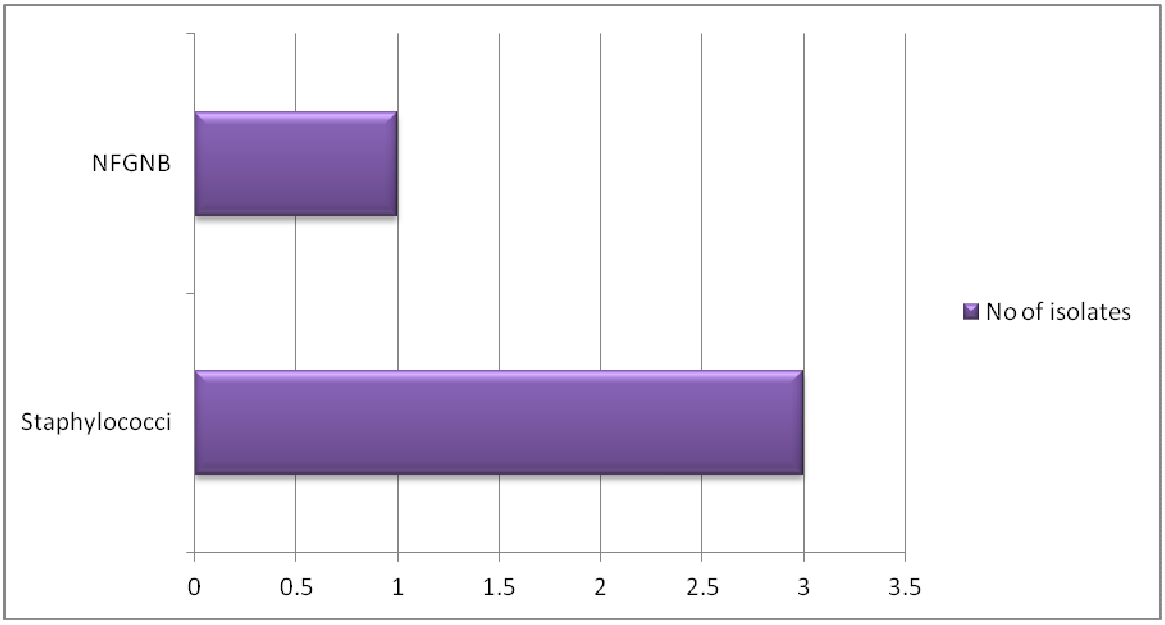
Total no of isolates: 2



GENERAL TABLE

Total no of sample: 4

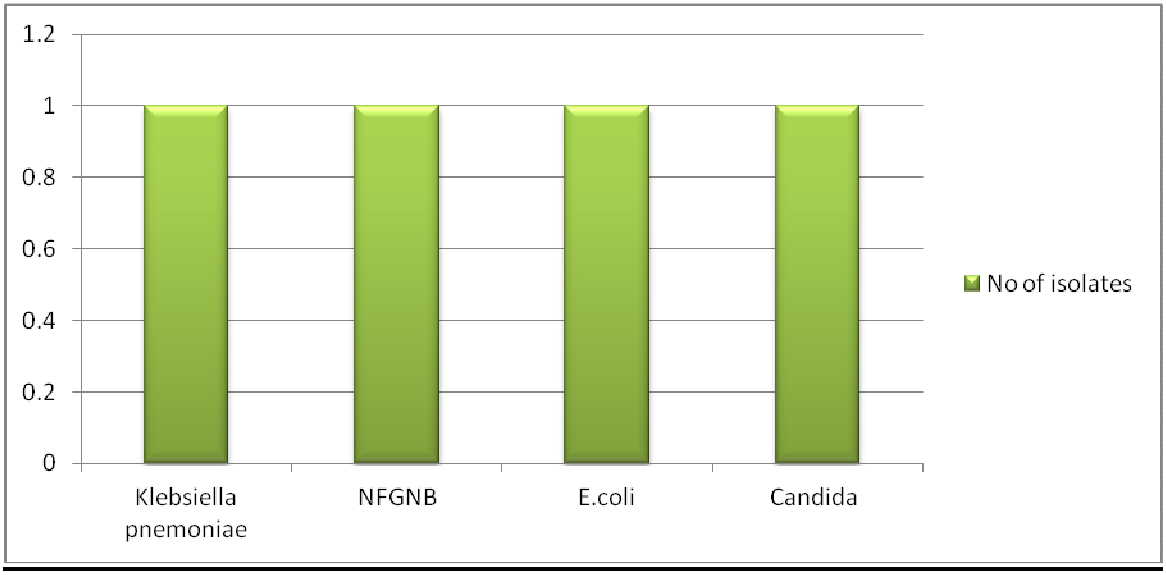
Total no of isolates: 4



MORTAR AND PESTLE

Total no of sample: 2

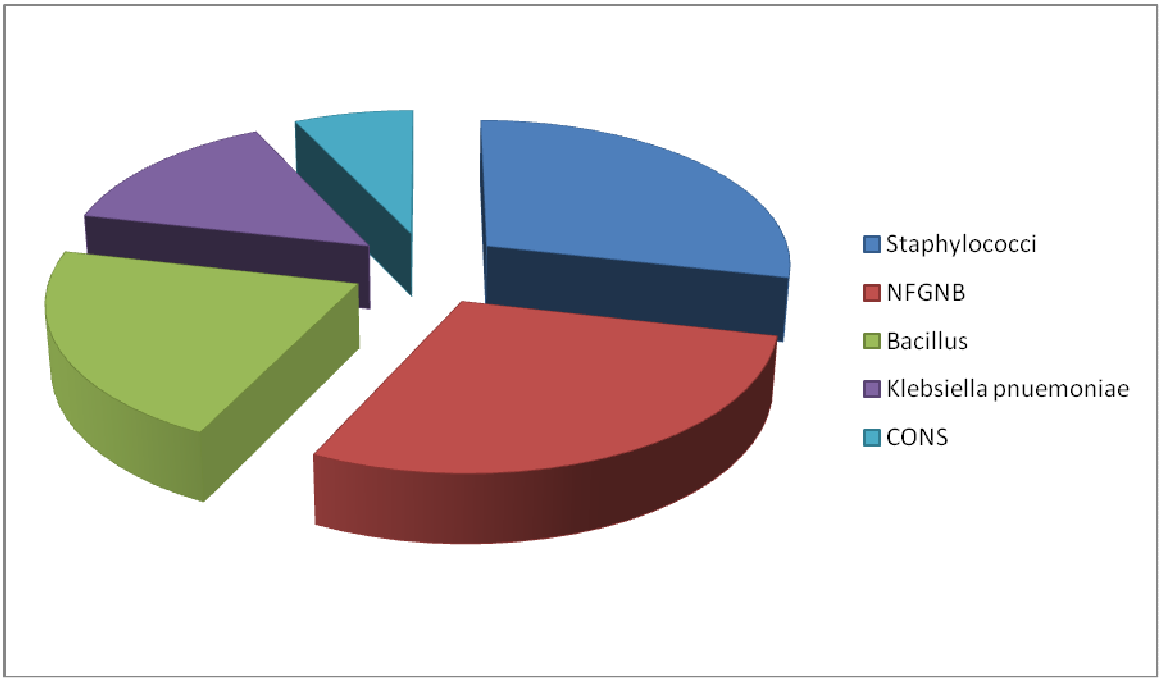
Total no of isolates: 4



PENDENT

Total no of sample: 3

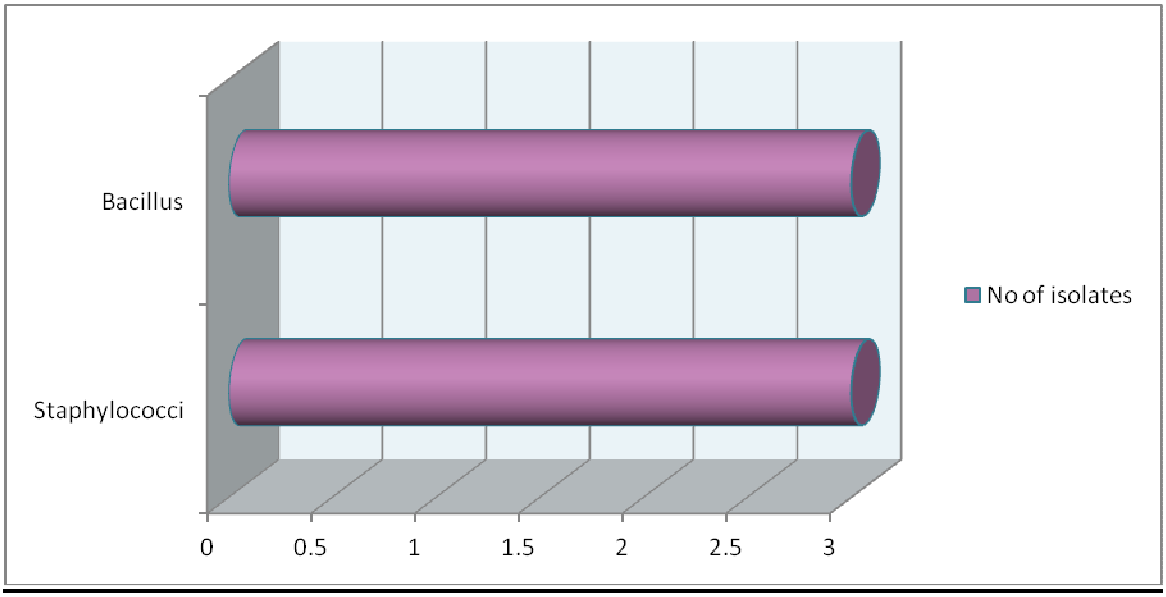
Total no of isolates: 14



WINDOW

Total no of sample: 8

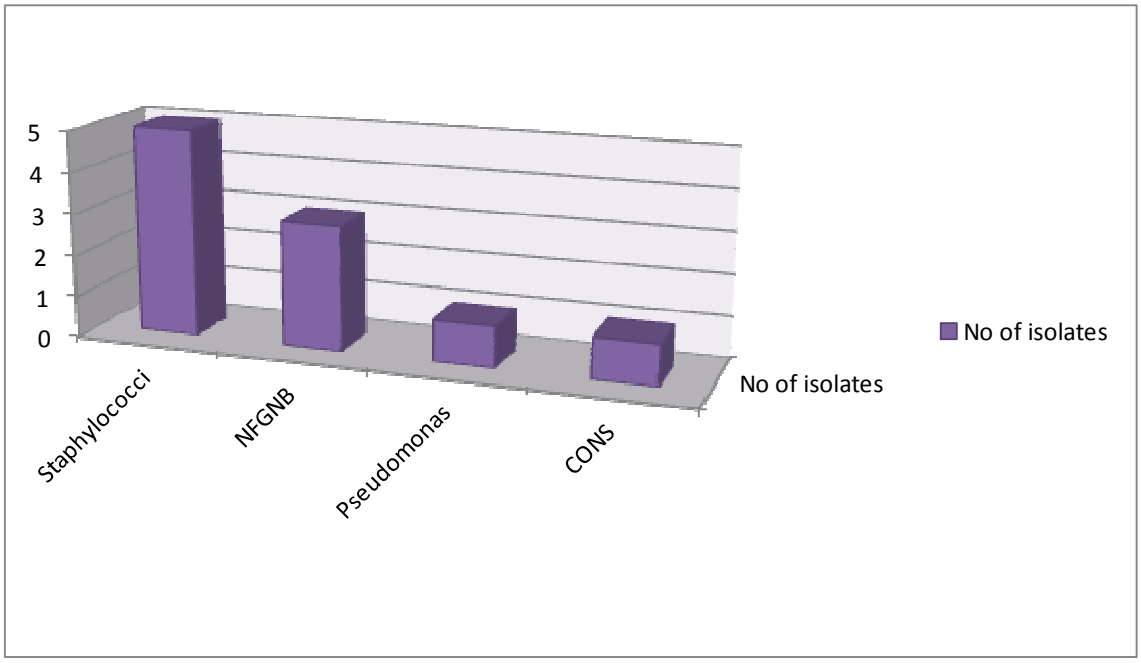
Total no of isolates: 6



CUBICLE SEPARATING GLASS

Total no of samples: 3

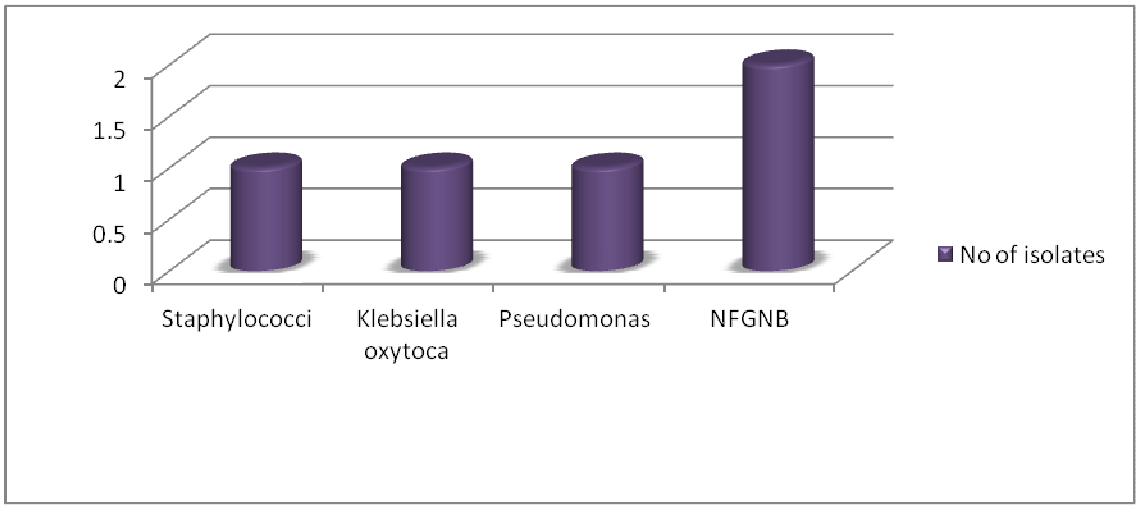
Total no of isolates: 8



VENTILATOR SAMPLE (inside)

Total no of samples: 2

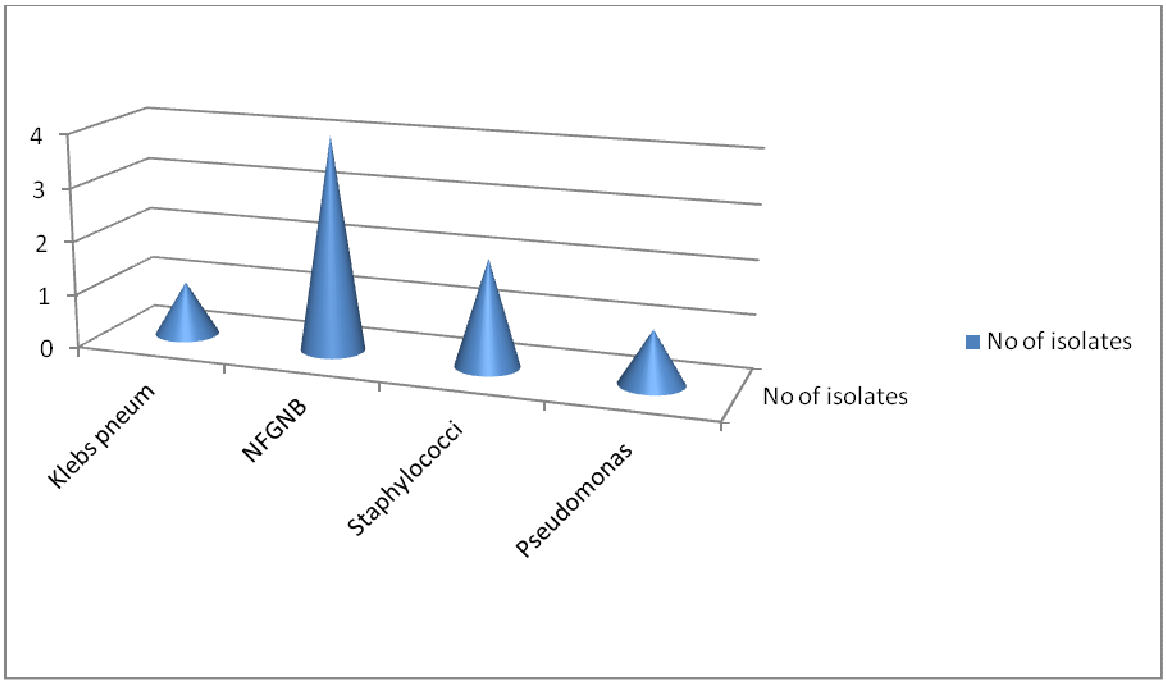
Total no of isolates: 5



VENTILATOR STAND (outside)

Total no of samples: 2

Total no of isolates: 5



COMPARISON OF PHASE II & III TRIAL

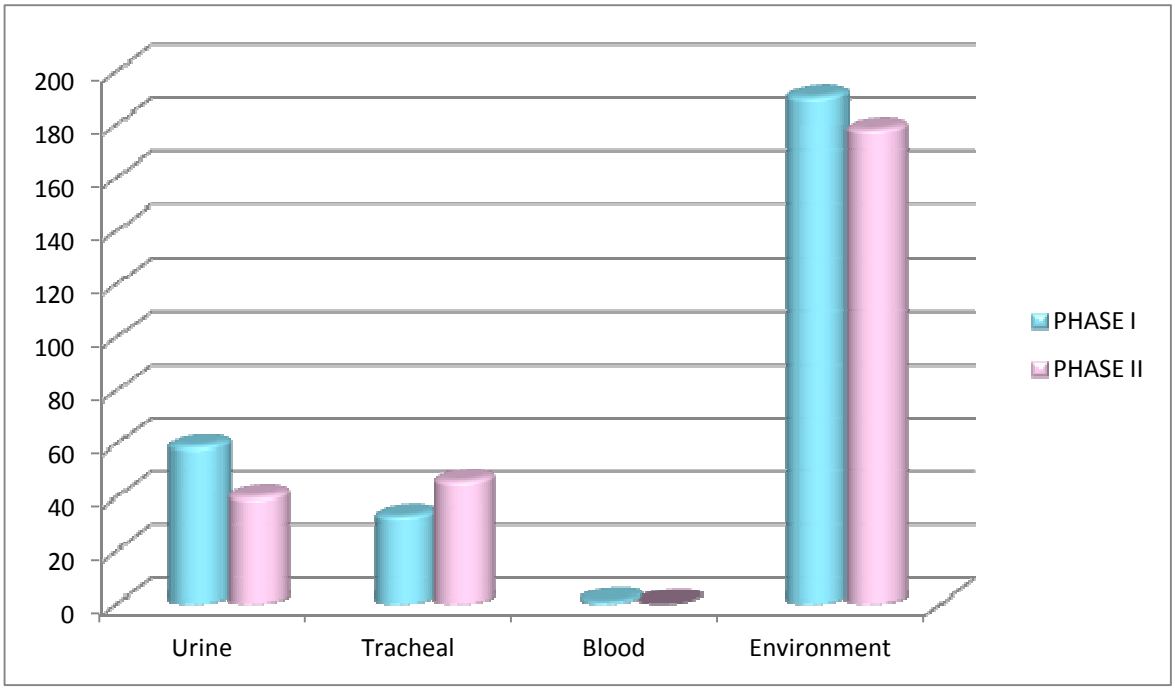
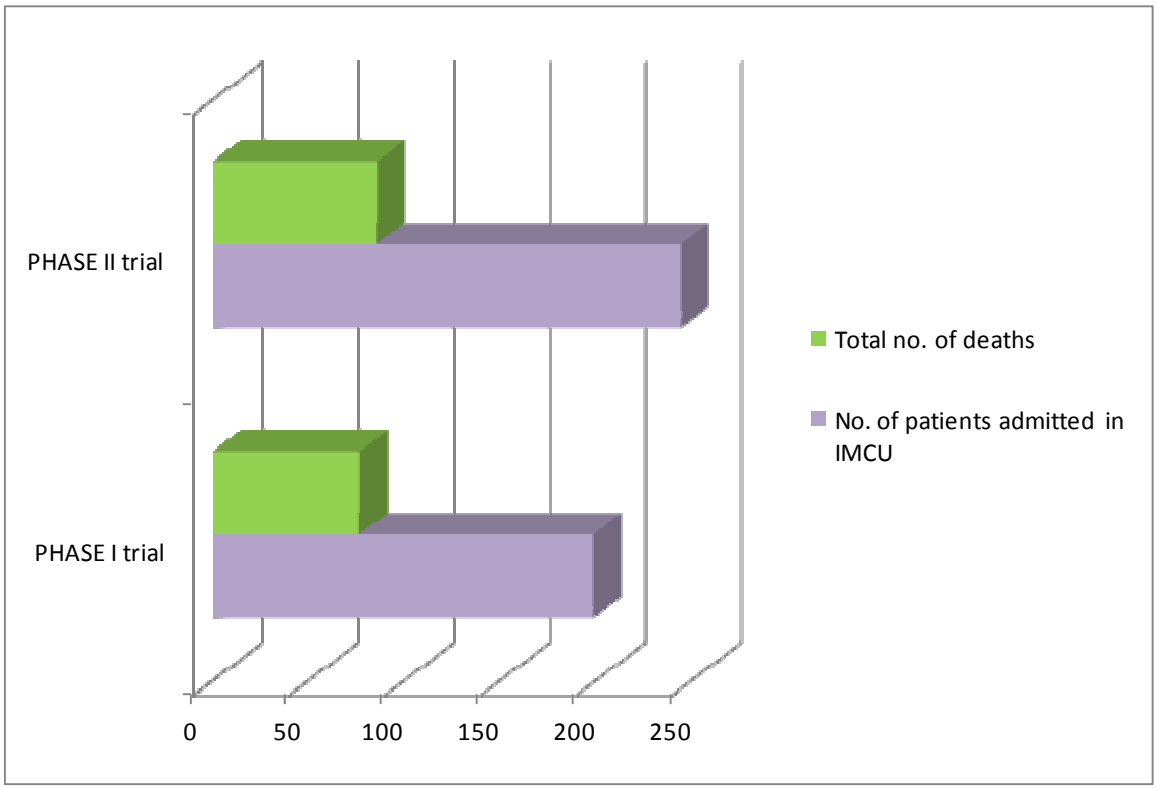


TABLE 14. MORTALITY RATES DURING PHASE II & PHASE III TRAIL

PHASE	NO. OF PATIENTS ADMITTED IN IMCU	TOTAL NO. OF DEATHS	%
PHASE II Trial	**198**	**76**	**38.38%**
PHASE III Trial	**244**	**85**	**34.83%**



On analyzing the data by T - test, the P values are as follows:

PATIENT SAMPLES

ORGANISM	PHASE II	PHASE III	TOTAL	P-Value
Candida species	**22**	**19**	**41**	**0.5**
Pseudomonas aeruginosa	**15**	**7**	**22**	**< 0.0001**
CONS	**3**	**5**	**8**	**0.9**

ORGANISM	PHASE II	PHASE III	TOTAL	P-Value
E.coli	**11**	**4**	**15**	**< 0.001**
NFGNB	**9**	**2**	**11**	**< 0.001**

ENVIRONMENTAL SAMPLES

ORGANISM	PHASE II	PHASE III	TOTAL	P-Value
CONS	**66**	**5**	**71**	**< 0.0001**
Bacillus	**36**	**23**	**59**	**0.01**
Enterococci	**29**	**26**	**55**	**0.9**
Pseudomonas aeruginosa	**26**	**3**	**29**	**< 0.0001**
Candida species	**6**	**13**	**19**	**< 0.05**

DISCUSSION

Hospital acquired infection (HAI) are one of the major cause of mortality and morbidity of human lives. It also causes a huge economic burden. Many strategies and protocols are adopted by individual hospitals to curtail the impact of HAI. Our hospital, Rajiv Gandhi Government General Hospital caters around 15000 out patients and 7000 in patients every day. It's not surprising that the prevalence of infections is so high in wards and emergency rooms. So a study on the prevalence of infection in the intensive medical care unit and its sensitivity and resistance patterns and the adoption of various strategies to contain those infections will be a relevant issue.

We conducted the study in three phases. Phase I is a retrospective part of this study. It was conducted in the period between 01-08-2010 to 31-10-2010. In this phase, we collected the data from the case sheets about the predominant pathogens isolated from the patient's specimens and their prevalence, sensitivity and resistance patterns were assessed. Total number of patients admitted during that period and the duration of stay and mortality rates were calculated.

Coagulase negative staphylococcus (31.97 %) was the predominant organism isolated during that period followed by *Proteus mirabilis* (17.21 %), *Pseudomonas aeruginosa* (11.48 %) and *Klebsiella pneumonia* (11.48 %). Mortality rate during that period stood by 76%.

Phase II study was conducted in the period of 01.12.2010 to 28.02.2011. In this period, extensive survey was undertaken. Specimens were collected from environmental sources such as bed, A/C vents, screens, patient's attenders, health workers such as doctors, nurses and attending workers. Patients blood, urine samples, tracheal aspirate, CVP catheter tips, urinary catheter tips were collected. A total of 97 samples were taken and analysed. 190 isolates were obtained from environmental samples and 86 isolates were from patient's side. *Coagulase negative staphylococcus* (34.74 %) was the predominant organism isolated from the environment of our IMCU. *Bacillus* (15.26 %) and *Pseudomonas* (13.68 %) are the next prevalent organisms. *Candida species* 22.09 % was the most prevalent organism from patient's isolates followed by *Staphylococcus aureus* (16.28 %).

Out of 95 samples from patients, 47 (49.47 %) samples were of urine specimen. Out of 47 urine samples, organisms were isolated from 36 (76.6%) samples and 11 (23.4%) samples showed no growth of which *Candida* (50%) was the predominant organism identified followed by *E.coli* (27.78%). A total of 29 samples were taken from tracheal secretions. 22 samples showed positive results and no growth in remaining 7 samples. 33 isolates were obtained. *Pseudomonas aeruginusa* (39.39%) was the predominant organism.

17 samples were of blood and all the samples except one were negative. The organism isolated was NFGNB. 2 CVP samples were obtained and their cultures showed negative results.

At the end of phase II study, preventive strategies were adopted. Preventive measures include education of health workers, protocols framed for change of linens, proper disposal of wastes, restricted entries, fumigation etc. These measures were followed for around 6 months.

Phase III study was started on 01.07.2011 and continued till 30.09.2011. The collection procedure was repeated. 98 samples were taken from the environmental source which yielded 178 isolates. Here the predominant organism was *Staphylococci* (39.89%). The pattern has changed from coagulase negative staphylococci which was predominant in phase 2 to staphylococci. Pseudomonas which was prevalent in phase 2 (13.62%) has drastically reduced to 1.7%.

51 urine samples were collected, 40 samples showed growth and 11 samples were negative. *Candida* species (40%) were the predominant organism isolated. Both in Phase II & III, *Candida* were the most prevalent organism. This result has emphasized the specific strategies and protocols needed to contain this dreaded organism. This throws more light on methods needed to be adopted to eradicate this organism.

31 samples were taken from tracheal secretions, of which 24 samples showed positive results and 7 were negative. *Staphylococcus aureus* (30.43%) was the predominant species. Here the *Pseudomonas* which was more prevalent in the phase 2 (39.39%) became less prevalent (10.87%). 12 blood samples

were collected and all the samples showed negative culture. 2 CVP catheter samples were taken and cultured. They showed no growth.

Analysing the data statistically by the T- test, it is found that the reduction of *Pseudomonas, E.coli and NFGNB* from the patient sample after preventive measures is significant with P value < 0.001. Similarly the reduction of *CONS, Pseudomonas* from the environmental samples is significant.

Thus, this study has demonstrated the prevalence of various organisms in various samples. The measures taken to contain the organisms even though was good but was not adequate enough to show the results. This emphasizes the need for more stringent measures and the specific protocols for eradicating particular and dormant organisms to be adopted.

CONCLUSION

Our study was done in three phases to observe the pattern and prevalence of infection. Our observation showed that the nosocomial infections are the major cause of mortality and morbidity. It imposes a huge economic burden on the hospitals and society. We observed the changing pattern of the prevalence of the organism over a period. This implies an important need to survey the wards periodically to tackle the nosocomial infections and to prevent the development of resistance.

In our study, the prevalence of organisms was more in the samples from the environment. This emphasized the need for the importance of maintaining utmost sterilization. Even though the health workers are aware of nosocomial infections and its dreaded consequences, a strong protocol oriented approach is the need of the hour. Education of health workers and the common public will play a crucial role.

Candida was predominant in the environmental samples in both phase 2 and phase 3 study. This implies organism specific preventive measures should also be needed as species like *Candida* may be one of the major causes of mortality.

The prevalence of organisms had not significantly reduced in phase 3 study. This shows the need for effective protocol oriented approach and education for prevention.

To conclude, every hospital settings should draw their own protocol to defend nosocomial infections. Periodic surveillance and education of both health workers and public is strongly recommended. The importance of simple barrier precautions must be emphasized through repeated teaching of staff for their wholehearted compliance and good health practices. Prevention of nosocomial infections will reduce the mortality and morbidity of patients and help reduce the economic burden in the health sector.

LIMITATIONS

This study has the following limitations:

1. Preventive measures were not adequate and protocol oriented. There were also certain practical difficulties in following the preventive measures.
2. Educating the population and health workers and their compliance in following it up could not be strictly monitored.
3. Resistance pattern of the prevalent organisms was not looked for.
4. Bacteriological load was not calculated.

ABBREVATIONS

ARDS	Acute Respiratory Distress Syndrome
ADEM	Acute Demyelinating Encephalomyelopathy
AIDP	Acute Inflammatory Demyelinating Polyneuropathy
BSI	Bloodstream Infections Pneumonias
CIDP	Chronic Inflammatory Demyelinating Polyneuropathy
CKD	Chronic Kidney Disease
CNS	Central Nervous System
CONS	Coagulase Negative Staphylococcus
CVS	Cardio Vascular System
E.Coli	Escherechia Coli
FRI	Febrile Respiratory Illness
GBS	Guillaine Barre Syndrome
GI	Gastrointestinal Illness
HAP	Hospital Associated Pneumonia
HCAI	Health Care Associated Infections

HCW	Health Care Worker
HEPA	High Efficiency Particulate Air
HME	Heat Moister Exchanger
HMEF	Heat Moister Exchanger with Filter
HIV	Human Immuno-deficiency Virus
ICU	Intensive Care Unit
MRSA	Methicillin Resistant Staph Aureus
NFGNB	Non-Fermentive Gram Negative Bacilli
NI	Nosocomial Infections
RS	Respiratory System
SARS	Severe Acute Respiratory Syndrome
SHT	Sytemmic Hypertention
S.aureus	Staphylococcus aureus
TB	Tuberculosis
UTI	Urinary Tract Infection
VAP	Ventilator Associated Pneumonia

PROFORMA

Name :

Age :

Sex :

Occupation :

Marital status :

Address :

IP.No :

Date of admission :

Date of transfer :

Referral from :

Date of sampling :

Admission diagnosis :

BRIEF PATIENT HISTORY:

Past or recent History of hospitalization :

Treatment for medical/surgical illness :

Drug history :

Allergy history :

Vaccination history :

Personal history :

History of alcohol and drug abuse :

High risk behavior :

PHYSICAL EXAMINATION

GENERAL EXAMINATION

Conscious level

Orientation

Febrile/Afebrile

Lymphadenopathy

Oral examination :

ENT examination :

Eye examination :

Skin examination :

Genital examination :

VITAL SIGNS

Pulse Rate :

Blood Pressure :

Respiratory rate :

Temperature :

CARDIOVASCULAR SYSTEM :

RESPIRATORY SYSTEM :

GASTROINTESTINAL SYSTEM:

CENTRAL NERVOUS SYSTEM :

GCS

INVESTIGATIONS

CBC

TC

DC

PCV

HEMATOCRIT

ESR

PLATELETS

LFT

TOTAL BILIRUBIN

AST

ALT

SAP

TOTAL PROTEIN

RFT

BLOOD SUGAR

UREA

SERUM CREATININE

Na+

K+

Chest X- ray:

Blood Culture :

Sputum/tracheal culture :

Urine culture :

HIV :

Special interventions :

Ventilator :

Dialysis :

Blood product :

TREATMENT

FINAL OUTCOME:

IMPRESSION:

SAMPLE	**BLOOD**		**URINE**		**TRACHEAL SWAB**		**SPECIAL SWABS**	
	I	L	I	L	I	L	I	L
ON ADMISSION								

AFTER 48 hrs								

L - Load

I - Isolate

INANIMATE OBJECTS

S.NO	SITE	ISOLATE	LOAD
1.			
2.			
3.			
4.			

MASTER CHART- ENVIRONMENTAL SAMPLES

PHASE II TRIAL

S.NO.	SAMPLE	DATE	ISOLATES
1.	2nd cubicle wall	16/12/10	**No growth**
2.	3rd cubicle floor	16/12/10	*NFGNB, Coagulase negative Staphylococci*
3.	4th cubicle bed	16/12/10	*Pseudomonas, Coagulase negative Staphylococci, NFGNB*
4.	5th cubicle ventilator	16/12/10	*Coagulase negative Staphylococci*
5.	6th cubicle screen	16/12/10	*NFGNB*
6.	7th cubicle window	16/12/10	*NFGNB*
7.	Ambobag	16/12/10	**No growth**
8.	O_2mask	16/12/10	**No growth**
9.	Rani staff hand swab	16/12/10	**No growth**
10.	Banu worker hand swab	16/12/10	**No growth**
11.	Lavanya staff hand swab	16/12/10	**No growth**
12.	Unknown hand swab	16/12/10	**No growth**
13.	Antiseptic 1	16/12/10	**No growth**
14.	10th cubicle iv port	23/12/10	**No growth**
15.	11th cubicle monitor	23/12/10	*Coagulase negative Staphylococci, Pseudomonas, Enterobacter*
16.	12th cubicle tray	23/12/10	**No growth**
17.	14th cubicle bed	23/12/10	*Bacilli, Citrobacter*
18.	11th cubicle floor	23/12/10	*NFGNB, Coagulase negative Staphylococci*

S.NO.	SAMPLE	DATE	ISOLATES
19.	11th cubicle separating glass	23/12/10	*Coagulase negative Staphylococci, Enterococci, NFGNB, Bacillus*
20.	10th cubicle ventilator	23/12/10	*Klebsiella, Pseudomonas*
21.	Antiseptic 2	23/12/10	**No growth**
22.	5th cubicle window curtain	30/12/10	*Coagulase negative Staphylococci, Bacillus*
23.	6th cubicle ventilator stand	30/12/10	*Klebsiella, Pseudomonas*
24.	7th cubicle wall	30/12/10	*Bacillus, Pseudomonas, Coagulase negative Staphylococci*
25.	7th cubicle circuit box	30/12/10	*Coagulase negative Staphylococci,Pseudomonas*
26.	X-Ray lobby	30/12/10	*Coagulase negative Staphylococci, 2 NFGNB, Pseudomonas, Micrococci*
27.	Emergency drug tray	30/12/10	*2 NFGNB, Pseudomonas*
28.	Drug tray	30/12/10	*Pseudomonas*
29.	Laryngoscope	30/12/10	*Pseudomonas*
30.	8th cubicle multimonitor	19/1/11	*Coagulase negative Staphylococci*
31.	9th cubicle Bed spread	19/1/11	*Pseudomonas, Enterococci, NFGNB, Bacillus, Candida*
32.	10th cubicle screen	19/1/11	*Coagulase negative Staphylococci, Bacillus, Mirococci*
33.	11th cubicle screen	19/1/11	*Pseudomonas, Enterobacter, Micrococci*
34.	12th cubicle wall	19/1/11	*Coagulase negative Staphylococci*
35.	13th cubicle bed	19/1/11	*NFGNB, Coagulase negative Staphylococci*

S.NO.	SAMPLE	DATE	ISOLATES
36.	14^{th} cubicle floor	19/1/11	*Enterobacter, Coagulase negative Staphylococci, Bacillus*
37.	Ambobag	19/1/11	*Coagulase negative Staphylococci*
38.	Antiseptic 3	19/1/11	**No growth**
39.	O_2 mask	19/1/11	*Coagulase negative Staphylococci*
40.	Ounce glass	19/1/11	*Pseudomonas, NFGNB, Candida*
41.	Mortar and pestle	19/1/11	*Coagulase negative Staphylococci, Pseudomonas, Micrococci, Bacillus, Candida*
42.	Feeding syringe	19/1/11	*Coagulase negative Staphylococci, , Enterococci,Micrococci,Candida*
43.	Computer	19/1/11	*Coagulase negative Staphylococci, Enterococci*
44.	Phone	19/1/11	*Coagulase negative Staphylococci*
45.	Ventilator inside	19/1/11	**No growth**
46.	Ventilator outside	19/1/11	**No growth**
47.	X-Ray lobby	19/1/11	*Coagulase negative Staphylococci, Enterococci, Bacillus*
48.	Computer	23/2/11	*Coagulase negative Staphylococci, Bacillus*
49.	6^{th} cubicle bed	23/2/11	*Pseudomonas*
50.	Drug tray-2	23/2/11	*Coagulase negative Staphylococci, Micrococci*
51.	Emergency tray	23/2/11	*NFGNB, StaphylococcUS aureus*
52.	3^{rd} Bed spread	23/2/11	*Coagulase negative Staphylococci, Bacillus,*

S.NO.	SAMPLE	DATE	ISOLATES
			Enterococci
53.	7th cubicle screen	23/2/11	*Coagulase negative Staphylococci, Pseudomonas*
54.	6th cubicle ventilator stand	23/2/11	*2 Coagulase negative Staphylococci, Enterobacter*
55.	2nd cubicle separating glass	23/2/11	*Pseudomonas, NFGNB, Bacillus*
56.	Doctor's table	23/2/11	*Coagulase negative Staphylococci, Bacillus*
57.	Working table	23/2/11	**No growth**
58.	Drug table	23/2/11	*Coagulase negative Staphylococci*
59.	10th cubicle iv port	23/2/11	*Coagulase negative Staphylococci*
60.	Drug boxes	23/2/11	*Coagulase negative Staphylococci, EnterococcI,Bacillus*
61.	10th cubicle wall	23/2/11	*Coagulase negative Staphylococci*
62.	Ventilator stand	23/2/11	*Coagulase negative Staphylococci, Bacillus, Candida*
63.	10TH cubicle bed steel rim	23/2/11	*Coagulase negative Staphylococci*
64.	11th cubicle bed	23/2/11	*Coagulase negative Staphylococci*
65.	6th cubicle floor	23/2/11	*Coagulase negative Staphylococci*
66.	Antiseptics	23/2/11	**No growth**
67.	Attender seating area-1	27/2/11	*Coagulase negative Staphylococci, Klebsiella, Micrococci, Bacillus*
68.	Attender seating area-2	27/2/11	*Coagulase negative Staphylococci*
69.	Attender seating area-3	27/2/11	*Staphylococcus aureus, Psuedomonas, Bacillus*

S.NO.	SAMPLE	DATE	ISOLATES
70.	Attender seating area-4	27/2/11	*Enterococci, Bacillus*
71.	1st cubicle wall	27/2/11	*Coagulase negative Staphylococci*
72.	1st cubicle H.D monitor	27/2/11	*Coagulase negative Staphylococci, Enterococci*
73.	1st cubicle pendent	27/2/11	*Coagulase negative Staphylococci, EnterococcI,Bacillus*
74.	Working table	27/2/11	**No growth**
75.	Door knob	27/2/11	*Coagulase negative Staphylococci,Pseudomonas*
76.	Pendent	27/2/11	*Coagulase negative Staphylococci, EnterococcI,Bacillus*
77.	Cupboard	27/2/11	*Coagulase negative Staphylococci,Staphylococcus aureus,Micrococci*
78.	Skin cubicle wall	27/2/11	*Pseudomonas,Enterobacter*
79.	Skin cubicle floor	27/2/11	*Coagulase negative Staphylococci, Bacillus, Micrococci*
80.	Skin cubicle bed	27/2/11	*2 Coagulase negative Staphylococci, Enterobacter, Bacilli*
81.	Skin cubicle screen	27/2/11	*Coagulase negative Staphylococci, Bacillus*
82.	Veranda cupboard	27/2/11	*Coagulase negative Staphylococci*
83.	Phone	27/2/11	*Coagulase negative Staphylococci,NFGNB*
84.	Staff room	27/2/11	*Coagulase negative Staphylococci, EnterococcI,*

S.NO.	SAMPLE	DATE	ISOLATES
			Pseudomonas,Bacillus
85.	Bathroom	27/2/11	*Coagulase negative Staphylococci,2 NFGNB*
86.	1st cubicle bed	27/2/11	*2 Coagulase negative Staphylococci, NFGNB*
87.	2nd cubicle floor	27/2/11	*Enterobacter, Klebsiella, Coagulase negative Staphylococci, Bacillus*
88.	3rd cubicle wall	27/2/11	
89.	4th cubicle screen	27/2/11	*Coagulase negative Staphylococci, NFGNB, Enterococci*
90.	5th cubicle separating glass	27/2/11	*Coagulase negative Staphylococci*
91.	6th cubicle window	27/2/11	*Coagulase negative Staphylococci, Bacillus*
92.	7th cubicle iv port	27/2/11	**No growth**
93.	8th cubicle bed	27/2/11	*Pseudomonas, Coagulase negative Staphylococci, NFGNB, Bacilli*
94.	Veranda	27/2/11	*Staphylococc aureus, NFGNBPseudomonas,E.coli*
95.	1st cubicle floor	27/2/11	
96.	Veranda door	27/2/11	*Coagulase negative Staphylococci, Pseudomonas*
97.	Doctor's table	27/2/11	**No growth**

MASTER CHART-ENVIRONMENTAL SAMPLES

PHASE III TRIAL

S.NO	SAMPLE	DATE	ISOLATE
1.	2nd cubicle bed	07/07/11	*Staphylococci,candida*
2.	3rd cubicle wall	07/07/11	*Staphylococci*
3.	4th cubicle bed	07/07/11	**No growth**
4.	5th cubicle floor	07/07/11	*Staphylococci, NFGNB*
5.	6th cubicle screen	07/07/11	*Staphylococci*
6.	7th cubicle window	07/07/11	*Staphylococci*
7.	Bed spread	07/07/11	*NFGNB,Candida*
8.	Antiseptic	07/07/11	**No growth**
9.	Computer	07/07/11	**No growth**
10.	General table	07/07/11	*Staphylococci*
11.	Iv stand	14/07/11	*Staphylococci, Bacillus*
12.	Multimonitor	14/07/11	*NFGNB,Staphylococci,Bacillus*
13.	Biologic bin	14/07/11	*CONS, Candida*
14.	10th cubicle window	14/07/11	*Bacillus*
15.	Working staff hand	14/07/11	**No growth**
16.	12th cubicle bed	14/07/11	*Bacillus*
17.	14th cubicle wall	14/07/11	*NFGNB*
18.	11th cubicle floor	14/07/11	*Staphylococci, Bacillus*
19.	11th cubicle screen	14/07/11	*Staphylococci,NFGNB*
20.	10th cubicle bed spread	14/07/11	*NFGNB,Candida*
21.	Ambu bag	21/07/11	**No growth**
22.	5th cubicle screen	21/07/11	*Catalse-ve bile esculin –ve G+ve*

S.NO	SAMPLE	DATE	ISOLATE
			cocci
23.	6th cubicle bed	21/07/11	*NFGNB*
24.	7th cubicle wall	21/07/11	*Bacillus*
25.	7th cubicle floor	21/07/11	*Bacillus*
26.	X-Ray lobby	21/07/11	**No growth**
27.	Fridge	21/07/11	*Bacillus*
28.	Drug tray	21/07/11	*Staphylococci*
29.	Feeding syringe	21/07/11	**No growth**
30.	Mortar & pestle	21/07/11	*NFGNB, Candida*
31.	Ambu bag	03/08/11	**No growth**
32.	4th cubicle bed	03/08/11	*Klebsiella oxytoca*
33.	2nd cubicle sep glass	03/08/11	*3 Staphylococci,Candida*
34.	Curtain	03/08/11	*NFGNB,2Staphylococci, Enterococci*
35.	Floor	03/08/11	*Klebsiella oxytoca, Staphylococci,Candida*
36.	Iv stand	03/08/11	*2 Staphylococci, 1 Bacillus,Klebsiella oxytoca CONS, Candida*
37.	Milk glass	03/08/11	*NFGNB*
38.	Wall	03/08/11	*Staphylococci*
39.	Bed spread	10/08/11	*Klebsiella pneumoniae, Bacillus, NFGNB*
40.	5th cubicle sep glass	10/08/11	*2 NFGNB*
41.	Floor	10/08/11	*Klebsiella pneumonia, ,Staphylococci,Candida*
42.	General table	10/08/11	*Staphylococci*
43.	Iv stand	10/08/11	*NFGNB*

S.NO	SAMPLE	DATE	ISOLATE
44.	Mortar & pestle	10/08/11	*Klebsiella Pneumoniae, E.coli,*
45.	Multimonitor	10/08/11	*Klebsiella pneumoniae,2 NFGNB,Staphylococci,Bacillus*
46.	Pendant	10/08/11	*3NFGNB,Staphylococci,Bacillus, Klebsiella pneumonia*
47.	Screen	10/08/11	*Klebsiella pneumoniae,Enterobacter*
48.	Ventilator outside	10/08/11	*Klebsiella pneumonia, 2NFGNB*
49.	Wall	10/08/11	*Staphylococci, ,NFGNB*
50.	8th cubicle bed	24/08/11	*Staphylococci, candida*
51.	8th cubicle sep glass	24/08/11	*Staphylococci*
52.	Curtain	24/08/11	*3 Staphylococci, Candida*
53.	X ray lobby	24/08/11	*Staphylococci*
54.	Floor	24/08/11	*Staphylococci, Bacillus, Enterococci,Candida*
55.	Multimonitor	24/08/11	*Klebsiella pneumoniae, Bacillus,Staphylococci, CONS*
56.	Pendant	24/08/11	*2 Staphylococci,Bacillus,Klebsiella pneumonia*
57.	Screen	24/08/11	*Staphylococci*
58.	Wall	24/08/11	*Staphylococci, Bacillus*
59.	Window	24/08/11	*Staphylococci,2Bacillus*
60.	4th cubicle bed	05/09/11	*Bacillus*
61.	6th cubicle sep glass	05/09/11	*NFGNB,Staphylococci,CONS, Pseudomonas*
62.	Curtain	05/09/11	*NFGNB,2 Staphylococci*
63.	Drug tray	05/09/11	*Staphylococci*

S.NO	SAMPLE	DATE	ISOLATE
64.	Floor	05/09/11	*Staphylococci, , Catalase-ve bile esculin –ve G+ve cocci*
65.	General table	05/09/11	*Staphylococci, NFGNB*
66.	Pendant	05/09/11	*NFGNB,Staphylococci,Bacillus, Catalase-ve bile esculin –ve G+ve cocci*
67.	Screen	05/09/11	*Staphylococci, NFGNB, CONS*
68.	Wall	05/09/11	*Staphylococci, Bacillus*
69.	Window	05/09/11	*Staphylococci*
70.	Bed spread	14/09/11	*NFGNB, Staphylococci,Bacillus, Candida*
71.	Biologic bin	14/09/11	*Staphylococci, Bacillus*
72.	Computer	14/09/11	**No growth**
73.	Drug tray	14/09/11	*NFGNB, 2Staphylococci*
74.	Drug table	14/09/11	*Staphylococci*
75.	Fridge	14/09/11	*Staphylococci*
76.	Floor	14/09/11	*Klebsiella pneumonia, 2Staphylococci, NFGNB, Catalase-ve bile esculin –ve G+ve cocci*
77.	Screen	14/09/11	*2 Staphylococci, NFGNB*
78.	Ventilator inside	14/09/11	*NFGNB,Pseudomonas,Klebsiella oxytoca, Staphylococci*
79.	Ventilator outside	14/09/11	*2 Staphylococci, 2NFGNB,Pseudomonas*
80.	Wall	14/09/11	*Staphylococci, Bacillus*
81.	Bed	21/09/11	*Catalase-ve bile esculin –ve G+ve cocci*
82.	Skin cubicle bed	21/09/11	*Bacillus*

S.NO	SAMPLE	DATE	ISOLATE
83.	Wall	21/09/11	*NFGNB*
84.	Floor	21/09/11	*Staphylococci*
85.	Screen	21/09/11	*Staphylococci*
86.	Drug tray	21/09/11	*Staphylococci*
87.	Feeding syringe	21/09/11	**No growth**
88.	Drug table	21/09/11	*Staphylococci*
89.	General table	21/09/11	**No growth**
90.	Curtain	21/09/11	*NFGNB,Staphylococci*
91.	Bed	28/09/11	*Staphylococci,candida*
92.	Wall	28/09/11	*Staphylococci*
93.	Floor	28/09/11	*Enterobacter, Bacilli*
94.	Ventilator inside	28/09/11	*NFGNB*
95.	Antiseptic	28/09/11	**No growth**
96.	Workg staff hand	28/09/11	**No growth**
97.	Workg staff hand	28/09/11	**No growth**
98.	Workg staff hand	28/09/11	**No growth**

MASTER CHART PHASE II TRIAL - PATIENT SAMPLE													
S.No.	Name	Age	Sex	IP No.	D.O.A.	D.O.S.	PR	BP	Temperature	CVS	RS	CNS	Diagnosis
1	Savithri	28yrs	F	99595	02-12-2010	14-12-2010	90	130/80	98.4F	N	N	N	GBS
2	Kumar	35yrs	M	99640	07-12-2010	14-12-2010	86	120/80	98.4F	N	N	N	Hanging
3	Kousalya	40yrs	F	103568	16-12-2010	22-12-2010	70	120/80	98.4F	N	N	N	Strangultion
4	Pushpalatha	22yrs	F	104090	18-12-2010	22-12-2010	86	110/70	98.4F	N	N	N	AIDP
5	Poorani	48yrs	F	102998	15-12-2010	22-12-2010	94	130/90	98.4F	N	N	N	AIDP
6	Senthil kumar	26yrs	M	103224	15-12-2010	22-12-2010	80	120/80	98.4F	N	N	N	Young stroke/Rt hemiparesis
7	Karthika	22yrs	F	104617	20-12-2010	22-12-2010	82	90/60	98.4F	N	N	N	Myasthenia Gravis
8	Kalavathy	22yrs	F	104956	20-12-2010	22-12-2010	100	130/90	98.4F	N	N	N	Primary Pulm HTN
9	Amudha	51yr	F	86757	20-12-2010	22-12-2010	88	120/80	98.4F	N	N	N	CIDP
10	Savithri	28yrs	F	99595	02-12-2010	22-12-2010	90	130/80	98.4F	N	N	N	GBS
11	Pushpalatha	22yrs	F	104090	18-12-2010	23-12-2010	86	110/70	98.4F	N	N	N	AIDP
12	Poorani	48yrs	F	102998	15-12-2010	23-12-2010	94	130/90	98.4F	N	N	N	AIDP
13	Savithri	28yrs	F	99595	02-12-2010	23-12-2010	90	130/80	98.4F	N	N	N	GBS
14	Senthil kumar	26yrs	M	103224	15-12-2010	22-12-2010	80	120/80	98.4F	N	N	N	Young stroke/Rt hemiparesis
15	Karthika	22yrs	F	104617	20-12-2010	22-12-2010	82	90/60	98.4F	N	N	N	Myasthenia Gravis
16	Kameshwaran	18yrs	M	107204	28-12-2010	30-12-2010	88	120/80	98.4F	N	N	N	Hanging
17	Kumar	45yrs	M	105549	25-12-2010	30-12-2010	80	130/90	98.4F	N	N	N	GBS
18	Shridevi	35yrs	F	107521	30-12-2010	12-01-2011	92	90/60	98.4F	N	N	N	SHT/CAD/CKD
19	Lakshmi	20yrs	F	1409	05-01-2011	12-01-2011	78	110/70	98.4F	N	N	N	Cortical Venous Thrombosis
20	Mohandas	50yrs	M	1756	06-01-2012	12-01-2011	80	100/60	98.4F	N	N	N	Rheumatoid arthritis/ACD
22	Deepavathani	24yrs	F	2928	10-01-2011	12-01-2011	100	120/80	98.4F	N	N	N	Hanging
23	Pushpalatha	22yrs	F	104090	18-12-2010	12-01-2011	86	110/70	98.4F	N	N	N	AIDP
24	Ashokan	37yrs	M	107045	31-12-2010	19-01-2011	100	110/80	98.4F	N	N	N	Pericardial effusion
25	Prabu	33yrs	M	2897	10-01-2011	19-01-2011	78	140/70	98.4F	N	N	N	Cervical cord compression
26	Abdul rehman	50yrs	M	3236	11-01-2011	19-01-2011	90	110/80	98.4F	N	N	N	CVA/Lt hemiplegia
27	Padmashree	25yrs	F	3720	13-01-2011	19-01-2011	88	110/70	98.4F	N	N	N	Parachute mitral valve MS/AF
28	Pushpalatha	22yrs	F	104090	18-12-2010	19-01-2011	86	110/70	98.4F	N	N	N	AIDP
29	Deepavathani	24yrs	F	2928	10-01-2011	19-01-2011	100	120/80	98.4F	N	N	N	Hanging
30	Shridevi	35yrs	F	107521	30-12-2010	19-01-2011	92	90/60	98.4F	N	N	N	SHT/CAD/CKD
31	Uma chandran	50yrs	M	4655	18-01-2011	26-01-2011	84	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
32	Pushpalatha	22yrs	F	104090	18-12-2010	26-01-2011	86	110/70	98.4F	N	N	N	AIDP
33	Deepavathani	24yrs	F	2928	10-01-2011	26-01-2011	100	120/80	98.4F	N	N	N	Hanging
34	Chaterjee	48yrs	M	5861	20-01-2011	27-01-2011	60	130/90	98.4F	N	N	N	SHT/Rec.CVA/Lt Hemiplegia
35	Arunachalam	40yrs	M	6781	24-01-2011	27-01-2011	72	110/70	98.4F	N	N	N	AIDP
36	Govinda naidu	50yrs	M	6875	25-01-2011	27-01-2011	86	130/80	98.4F	N	N	N	SHT/CKD
37	Prabu	33yrs	M	2897	10-01-2011	27-01-2011	78	140/70	98.4F	N	N	N	Cervical cord compression
38	Uma chandran	50yrs	M	4655	18-01-2011	27-01-2011	84	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
39	Pushpalatha	22yrs	F	104090	18-12-2010	27-01-2011	86	110/70	98.4F	N	N	N	AIDP
40	Deepavathani	24yrs	F	2928	10-01-2011	27-01-2011	100	120/80	98.4F	N	N	N	Hanging
41	Raja	27yrs	M	7115	24-01-2011	30-01-2011	72	110/70	98.4F	N	N	N	GBS
42	Sarasu	30yrs	F	8289	28-01-2011	30-01-2011	80	130/70	98.4F	N	N	N	Chr sen.motor radiculopathy
43	Pushpalatha	22yrs	F	104090	18-12-2010	30-01-2011	86	110/70	98.4F	N	N	N	AIDP
44	Deepavathani	24yrs	F	2928	10-01-2011	30-01-2011	100	120/80	98.4F	N	N	N	Hanging
45	Arunachalam	40yrs	M	6781	24-01-2011	30-01-2011	72	110/70	98.4F	N	N	N	AIDP
46	Karthick	21yrs	M	7690	26-01-2011	04-02-2011	92	110/70	98.4F	N	N	N	ADEM
47	Manikandan	27yrs	M	10321	02-02-2011	04-02-2011	82	120/80	98.4F	N	N	N	Hanging
48	Munniyammal	38yrs	M	10293	01-02-2011	04-02-2011	74	110/70	98.4F	N	N	N	AIDP
49	Kamala bai	40yrs	M	10250	01-02-2011	04-02-2011	88	120/80	98.4F	N	N	N	SHT/CVA/Lt Hemiplegia
50	Pushpalatha	22yrs	F	104090	18-12-2010	04-02-2011	86	110/70	98.4F	N	N	N	AIDP
51	Shridevi	35yrs	F	107521	30-12-2010	04-02-2011	92	90/60	98.4F	N	N	N	SHT/CAD/CKD
52	Uma chandran	50yrs	M	4655	18-01-2011	04-02-2011	84	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
53	Arunachalam	40yrs	M	6781	24-01-2011	04-02-2011	72	110/70	98.4F	N	N	N	AIDP
54	Sarasu	30yrs	F	8289	28-01-2011	04-02-2011	80	130/70	98.4F	N	N	N	Chr sen.motor radiculopathy
55	Anbuselvi	35yrs	F	12893	03-02-2011	07-02-2011	86	100/70	98.4F	N	N	N	AIDP
56	Uma chandran	50yrs	M	4655	18-01-2011	07-02-2011	84	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
57	Pushpalatha	22yrs	F	104090	18-12-2010	07-02-2011	86	110/70	98.4F	N	N	N	AIDP
58	Raja	27yrs	M	7115	24-01-2011	07-02-2011	72	110/70	98.4F	N	N	N	GBS
59	Sarasu	30yrs	F	8289	28-01-2011	07-02-2011	80	130/70	98.4F	N	N	N	Chr sen.motor radiculopathy
60	Chokalingam	60yrs	M	11523	07-02-2011	11-02-2011	88	150/100	98.4F	N	N	N	SHT/CVA/PCS
61	Sowmiya	15yrs	F	10255	03-02-2011	11-02-2011	90	100/60	98.4F	N	N	N	Sezuire disorder
62	Sekar	38yrs	M	11649	08-02-2011	11-02-2011	90	130/90	98.4F	N	N	N	Hanging
63	Maragatham	60yrs	M	11607	07-02-2011	11-02-2011	90	120/90	98.4F	N	N	N	SCC Lung
64	Venkataswamy	48yrs	M	11701	08-02-2011	11-02-2011	88	130/90	98.4F	N	N	N	AIDP
65	Uma chandran	50yrs	M	4655	18-01-2011	11-02-2011	84	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
66	Pushpalatha	22yrs	F	104090	18-12-2010	11-02-2011	86	110/70	98.4F	N	N	N	AIDP
67	Sarasu	30yrs	F	8289	28-01-2011	11-02-2011	80	130/70	98.4F	N	N	N	Chr sen.motor radiculopathy
68	Sekar	38yrs	M	11649	08-02-2011	16-02-2011	90	130/90	98.4F	N	N	N	Hanging
69	Pushpalatha	22yrs	F	104090	18-12-2010	16-02-2011	86	110/70	98.4F	N	N	N	AIDP
70	Sarasu	30yrs	F	8289	28-01-2011	16-02-2011	80	130/70	98.4F	N	N	N	Chr sen.motor radiculopathy

MASTER CHART PHASE II TRIAL - PATIENT SAMPLE														
CBC				RFT					LFT					HIV
Hb	TC	DC	PL	Sugar	Urea	Creatine	Na	K	TB	DB	OT	PT	TP	
9.2	4120	53/42/5	1.2	127	21	0.7	134	4	1	0.4	24	36	6	negative
12.6	5500	70/28/2	1.5	110	25	0.9	141	4.5	0.9	0.3	16	27	6.5	negative
11.5	6300	67/30/3	2.1	128	36	1	142	3.5	1	0.3	21	35		negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.7	4340	72/27/1	2.5	65	18	0.5	144	3.5	0.8	0.3	28	35	6.8	negative
13.7	6700	76/22/2	1.37	116	26	0.8	134	4	0.9	0.4	28	29	6.9	negative
11.6	7800	71/26/3	2	76	22	0.8	135	3.5	0.8	0.2	25	30	6.9	negative
8	6000	70/26/4	2.14	76	40	1.2	141	4.5	0.8	0.2	30	35	5.8	negative
10.7	4700	60/39/1	3.96	126	22	0.6	136	3.6	0.9	0.3	20	22	6.4	negative
9.2	4120	53/42/5	1.2	127	21	0.7	134	4	1	0.4	24	36	6	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.7	4340	72/27/1	2.5	65	18	0.5	144	3.5	0.8	0.3	28	35	6.8	negative
9.2	4120	53/42/5	1.2	127	21	0.7	134	4	1	0.4	24	36	6	negative
13.7	6700	76/22/2	1.37	116	26	0.8	134	4	0.9	0.4	28	29	6.9	negative
11.6	7800	71/26/3	2	76	22	0.8	135	3.5	0.8	0.2	25	30	6.9	negative
13.4	4500	68/30/2	2.8	80	24	0.9	140	4	1	0.4	26	24	6.4	negative
13	6800	75/23/2	3.2	120	29	1	139	3.9	0.9	0.3	27	32	7	negative
10.3	9000	74/23/3	1.01	124	39	1.4	130	3	0.8	0.3	23	30	6.5	negative
10.2	6370	60/31/3	1.7	98	23	0.9	146	4	0.7	0.2	25	35	6.3	negative
11.3	4390	56/40/4	1.5	104	32	1.4	140	3.8	0.8	0.2	29	31	6.6	negative
11.4	6370	49/48/3	1.9	100	44	1.2	145	3.9	0.9	0.3	24	29	6.2	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.8	7450	68/31/1	2.1	101	28	1	138	4.7	0.9	0.2	21	27	6.6	negative
14	7100	60/34/1	1.48	110	40	1.1	133	3.5	0.9	0.3	27	31	6.6	negative
12.5	9400	75/24/1	1.42	92	24	1	135	3.5	1.2	0.3	24	33	5.9	negative
11.6	8390	73/26/1	1.7	110	40	1.2	140	4.7	1.2	0.3	30	44	6.5	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.4	6370	49/48/3	1.9	100	44	1.2	145	3.9	0.9	0.3	24	29	6.2	negative
10.3	9000	74/23/3	1.01	124	39	1.4	130	3.4	0.8	0.3	23	30	6.5	negative
13.6	7800	68/29/3	3.2	106	37	1	137	3.7	0.6	0.1	22	27	6.2	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.4	6370	49/48/3	1.9	100	44	1.2	145	3.9	0.9	0.3	24	29	6.2	negative
10.3	4100	62/34/4	2.1	119	50	1.1	145	4.8	0.8	0.2	20	31	6.2	negative
13	5500	65/32/3	1.2	104	28	1	143	4	1	0.3	26	29	6.6	negative
12.8	4700	74/24/1	2.1	80	30	0.9	138	4.1	0.9	0.3	24	29	6.1	negative
14	7100	60/34/1	1.48	110	40	1.1	133	3.5	0.9	0.3	27	31	6.6	negative
13.6	7800	68/29/3	3.2	106	37	1	137	3.7	0.6	0.1	22	27	6.2	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.4	6370	49/48/3	1.9	100	44	1.2	145	3.9	0.9	0.3	24	29	6.2	negative
13.5	9000	55/47/3	1.58	120	28	0.9	141	4.2	0.7	0.2	27	31	7.4	negative
9.8	6110	70/26/4	1.6	110	31	1	140	3.1	0.8	0.2	21	16	6.4	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
11.4	6370	49/48/3	1.9	100	44	1.2	145	3.9	0.9	0.3	24	29	6.2	negative
13	5500	65/32/3	1.2	104	28	1	143	4	1	0.3	26	29	6.6	negative
13.6	8050	67/31/2	2.5	126	26	0.9	143	3.8	1.5	0.5	23	33	7	negative
12.2	7390	66/32/2	2.1	105	47	1.2	144	3.4	0.8	0.2	40	48	6.2	negative
12	8000	68/30/2	1.9	110	30	0.6	146	3.8	0.9	0.4	28	30	6.5	negative
11.6	7600	75/24/1	1.75	118	48	1.2	139	4	0.9	0.3	24	35	6.9	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
10.3	9000	74/23/3	1.01	124	39	1.4	130	3.4	0.8	0.3	23	30	6.5	negative
13.6	7800	68/29/3	3.2	106	37	1	137	3.7	0.6	0.1	22	27	6.2	negative
13	5500	65/32/3	1.2	104	28	1	143	4	1	0.3	26	29	6.6	negative
9.8	6110	70/26/4	1.6	110	31	1	140	3.1	0.8	0.2	21	16	6.4	negative
11.8	5890	72/27/1	2	108	38	0.8	144	4.1	0.9	0.2	25	30	7.5	negative
13.6	7800	68/29/3	3.2	106	37	1	137	3.7	0.6	0.1	22	27	6.2	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
13.5	9000	55/47/3	1.58	120	28	0.9	141	4.2	0.7	0.2	27	31	7.4	negative
9.8	6110	70/26/4	1.6	110	31	1	140	3.1	0.8	0.2	21	16	6.4	negative
11.8	8000	70/28//2	2.5	125	40	1.5	148	3.7	1	0.3	34	44	6.5	negative
9.5	4100	76/20/4	1.27	120	24	1.2	137	3.8	0.9	0.3	59	68	6.4	negative
13.8	9840	60/36/4	2.5	110	28	1	140	3.3	1	0.3	28	35	6.9	negative
9	9000	60/38/2	2.13	100	28	0.8	140	4	0.8	0.2	34	54	6	negative
14	5647	71/27/2	1.9	118	27	0.8	137	4.1	0.9	0.3	27	36	6.6	negative
13.6	7800	68/29/3	3.2	106	37	1	137	3.7	0.6	0.1	22	27	6.2	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
9.8	6110	70/26/4	1.6	110	31	1	140	3.1	0.8	0.2	21	16	6.4	negative
13.8	9840	60/36/4	2.5	110	28	1	140	3.3	1	0.3	28	35	6.9	negative
10.8	7500	60/38/2	1.49	109	30	1	138	3.9	0.9	0.2	26	29	7	negative
9.8	6110	70/26/4	1.6	110	31	1	140	3.1	0.8	0.2	21	16	6.4	negative

MASTER CHART PHASE II TRIAL - PATIENT SAMPLE				
Intervention	**Blood Culture**	**Urine Culture**	**Tracheal Culture**	**CVP Catheter Tip Culture**
tracheostomy	*	*Proteus mirabilis,E.coli*	*Proteus vulgaris*	*
tracheostomy	*	*	*Pseudomonas,Enterobacter,Citrobacter,E.coli,Candida(large & small creamy)*	*
none	*	*E.coli,Candida spp*	*	*
tracheostomy	*	*E.coli,Candida spp*	*Citrobacter,Psuedomonas*	*
ET tube	*	*Candida(large creamysmooth round white)*	**NO GROWTH**	*
none	*	*Enterococci spp*	*	*
none	*	**NO GROWTH**	*	*
none	*	**NO GROWTH**	Insufficient sample	*
none	NFGNB	*	*	*
tracheostomy	*	*	*Coagulase negative Staphylococcus*	*
tracheostomy	**NO GROWTH**	*	*	*
ET tube	**NO GROWTH**	*	*	*
tracheostomy	**NO GROWTH**	*	*	*
none	**NO GROWTH**	*Enterococci spp*	*	*
none	**NO GROWTH**	*	*	*
none	**NO GROWTH**	*	*	*
none	**NO GROWTH**	NFGNB	*	*
none	**NO GROWTH**	*Enterobacter spp,Candida spp*	*	*
none	*	*Enterobacter spp,Candida spp*	*	*
none	*	*Klebsiella,NFGNB*	*	*
intubation		**NO GROWTH**	INSUFFICIENT SAMPLE	*
tracheostomy	*	*Enterococci spp*	INSUFFICIENT SAMPLE	*
none	**NO GROWTH**	*	*	*
none	**NO GROWTH**	*	*	*
intubation	**NO GROWTH**	**NO GROWTH**	*Pseudomonas*	*
none	*	*Enterococci spp,Candida spp*	*	*
tracheostomy	**NO GROWTH**	*Candida spp*	*Pseudomonas*	*
intubation	**NO GROWTH**	*Candida spp*	*2Pseudomonas,Enterobacter*	*
none	**NO GROWTH**	*E.coli,Candida spp*	*	*
tracheostomy	*	NFGNB	**NO GROWTH**	*
tracheostomy	*	*	*Enterobacter,Candida*	*
intubation	*	*	*Enterobacter,Staphylococcus aureus*	*
none	*	**NO GROWTH**	*	*
intubation	*	*Candida spp,Enterococci spp*	*	*
none	*	*Candida spp*	*	*
none	*	*Enterococci spp*	*	*
tracheostomy	*	*Candida spp*	*	*
tracheostomy	*	*E.coli,Candida spp*	*	*
intubation	*	*Klebsiella spp*	*	*
none	*	*Pseudomonas aureginosa*	*	*
none	*	*Coagulase negative Staphylococcus*	*	*
tracheostomy	*	*Klebsiella oxytoca*	*	*
intubation	*	*Candida spp*	*	*
intubation	*	*	*Coagulase negative Staphylococcus*	*
none	*	*Staphylococcus aureus*	*	*
none	*	**NO GROWTH**	*	*
none	*	**NO GROWTH**	*	*
none	*	**NO GROWTH**	*	*
tracheostomy	*	*E.coli*	*NFGNB*	*
none	*	*	*	**NO GROWTH**
tracheostomy	*	*Enterococci spp*	*Pseudomonas*	*
intubation	*	*Klebsiella spp*	*Staphylococcus aureus*	*
none	*	*Klebsiella oxytoca*	*	*
none	*	*E.coli*	*	*
tracheostomy	*	*	*Pseudomonas,NFGNB,Candida*	**NO GROWTH**
tracheostomy	*	*Enterococci spp*	*Pseudomonas*	*
none	**NO GROWTH**	*	*	*
none	**NO GROWTH**	*	*	*
intubation	*	**NO GROWTH**	*Staphylococcus aureus*	*
intubation	*	**NO GROWTH**	*Pseudomonas*	*
intubation	*	*Candida spp*	*Pseudomonas*	*
intubation	*	*Pseudomonas aureginosa*	**NO GROWTH**	*
intubation	*	*Klebsiella spp*	*Pseudomonas*	*
tracheostomy	*	*NFGNB,Citrobacter spp*	*Pseudomonas,Enterobacter*	*
tracheostomy	*	*E.coli,Candida spp*	**NO GROWTH**	*
none	*	*E.coli,Candida spp*	*	*
intubation	*	**NO GROWTH**	*	*
tracheostomy	*	*NFGNB,Citrobacter spp*	*	*
none	*	*Klebsiella oxytoca,E.coli*	*	*

MASTER CHART PHASE III TRAIL - PATIENT SAMPLE													
S.No.	Name	Age	Sex	IP No.	D.O.A.	D.O.S.	PR	BP	Temperature	CVS	Rs	CS	Diagnosis
1	Diwakar	33yrs	M	56586	04-07-2011	07-07-2011	86	120/80	98.4F	N	N	N	Hanging
2	Jegadeesan	35yrs	M	50281	01-07-2011	07-07-2011	88	110/70	98.4F	N	N	N	GBS
3	Chinnamani	25yrs	M	51902	02-07-2011	07-07-2011	72	130/80	98.4F	N	N	N	Young stroke/Rt hemiparesis
4	Venkatesan	50yrs	M	56570	05-07-2011	07-07-2011	86	120/70	98.4F	N	N	N	ADEM
5	Jayamalini	40yrs	F	53584	04-07-2011	07-07-2011	90	120/80	98.4F	N	N	N	Hypoxic Ischemic Encephalopathy
6	Soundaraj	15yrs	M	54598	04-07-2011	07-07-2011	82	120/80	98.4F	N	N	N	AIDP
7	Kumar	38yrs	M	56521	05-07-2011	14-07-2011	80	90/60	98.4F	N	N	N	CIDP
8	Suresh	29yrs	M	52551	02-07-2011	14-07-2011	96	120/80	98.4F	N	N	N	AIDP
9	Devi	18yrs	F	58722	10-07-2011	14-07-2011	80	130/80	98.4F	N	N	N	Myasthenia Gravis
10	Sekar	45yrs	M	58572	10-07-2011	14-07-2011	88	120/80	98.4F	N	N	N	GBS
11	Karthick	21yrs	M	58890	11-07-2011	14-07-2011	90	100/70	98.4F	N	N	N	Hanging
12	Venkatesan	19yrs	M	58907	12-07-2011	14-07-2011	86	110/80	98.4F	N	N	N	SHT/CVA/PCS
13	Thambiah	60yrs	M	69860	07-08-2011	10-08-2011	82	100/60	98.4F	N	N	N	Hanging
14	Rajkumar	23yrs	M	65985	01-08-2011	10-08-2011	72	130/90	98.4F	N	N	N	CVA/Lt hemiplegia
15	Manimala	26yrs	F	68157	04-08-2011	10-08-2011	88	90/60	98.4F	N	N	N	Hypoxic Ischemic Encephalopathy
16	Damodharan	38yrs	M	69980	07-08-2011	10-08-2011	82	130/90	98.4F	N	N	N	Hanging
17	Prathab	16yrs	M	69866	07-08-2011	10-08-2011	88	120/80	98.4F	N	N	N	GBS
18	Subramani	60yrs	M	71228	08-08-2011	10-08-2011	72	110/70	98.4F	N	N	N	GBS
19	Gyansingh	30yrs	M	74880	22-08-2011	24-08-2011	78	90/60	98.4F	N	N	N	Hanging
20	Murali	26yrs	M	70652	08-08-2011	24-08-2011	80	120/80	98.4F	N	N	N	Paraplegia
21	Gandhi	50yrs	M	76023	18-08-2011	24-08-2011	88	100/70	98.4F	N	N	N	GBS
22	Yusuf	25yrs	M	71252	08-08-2011	24-08-2011	84	100/60	98.4F	N	N	N	AIDP
23	Veeraraghavan	60yrs	M	76145	18-08-2011	24-08-2011	90	110/80	98.4F	N	N	N	CVA/Rt hemiplegia
24	Kumar	35yrs	M	72912	10-08-2011	24-08-2011	78	140/70	98.4F	N	N	N	GBS
25	Deepalakshmi	28yrs	F	74510	17-08-2011	24-08-2011	80	110/80	98.4F	N	N	N	Myasthenia Gravis
26	Subramani	60yrs	M	71228	08-08-2011	24-08-2011	72	110/70	98.4F	N	N	N	GBS
27	Velu	40yrs	M	79372	01-09-2011	05-09-2011	86	110/70	98.4F	N	N	N	Hanging
28	Kameshwari	30yrs	F	77591	25-08-2011	05-09-2011	88	120/80	98.4F	N	N	N	Pemphigus
29	Latha	47yrs	F	77586	25-08-2011	05-09-2011	92	90/60	98.4F	N	N	N	AIDP
30	Murugan	33yrs	M	79453	02-09-2011	05-09-2011	84	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
31	Vijayalakshmi	20yrs	F	79467	02-09-2011	05-09-2011	86	140/90	98.4F	N	N	N	CVA/Recurrent CVA
32	Malliga	48yrs	F	78570	01-09-2011	05-09-2011	86	130/80	98.4F	N	N	N	SHT/CKD
33	Kameshwari	30yrs	F	77591	25-08-2011	14-09-2011	88	120/80	98.4F	N	N	N	Pemphigus
34	Vijayalakshmi	20yrs	F	79467	02-09-2011	14-09-2011	86	140/90	98.4F	N	N	N	CVA/Recurrent CVA
35	Malliga	48yrs	F	78570	01-09-2011	14-09-2011	86	130/80	98.4F	N	N	N	SHT/CKD
36	Indrani	25yrs	F	83467	12-09-2011	14-09-2011	90	120/60	98.4F	N	N	N	Hanging
37	Rajendran	50yrs	M	79989	05-09-2011	14-09-2011	78	140/70	98.4F	N	N	N	Myasthenia Gravis
38	Chandra	53yrs	F	81556	10-09-2011	14-09-2011	88	130/80	98.4F	N	N	N	SHT/Lt trans sinus thrombosis
39	Regima	31yrs	F	87665	07-09-2011	14-09-2011	84	110/70	98.4F	N	N	N	ADEM
40	Mariappan	45yrs	M	89854	18-09-2011	21-09-2011	100	120/80	98.4F	N	N	N	Hanging
41	Jeyakumar	37yrs	M	89732	18-09-2011	21-09-2011	72	110/70	98.4F	N	N	N	GBS
42	Rajendran	50yrs	M	79989	05-09-2011	21-09-2011	78	140/70	98.4F	N	N	N	Myasthenia Gravis
43	Subramani	60yrs	M	71228	08-08-2011	21-09-2011	72	110/70	98.4F	N	N	N	GBS
44	Deepalakshmi	28yrs	F	74510	17-08-2011	21-09-2011	80	110/80	98.4F	N	N	N	Myasthenia Gravis
45	Regima	31yrs	F	87665	07-09-2011	21-09-2011	84	110/70	98.4F	N	N	N	ADEM
46	Malliga	48yrs	F	78570	01-09-2011	21-09-2011	86	130/80	98.4F	N	N	N	SHT/CKD
47	Vasu	28yrs	M	95366	25-09-2011	28-09-2011	80	120/80	98.4F	N	N	N	Hanging
48	Prabhu	42yrs	M	96008	25-09-2011	28-09-2011	88	110/70	98.4F	N	N	N	AIDP
49	Suganya	17yrs	F	94556	24-09-2011	28-09-2011	92	120/80	98.4F	N	N	N	GBS
50	Subramani	60yrs	M	71228	08-08-2011	28-09-2011	72	110/70	98.4F	N	N	N	GBS
51	Deepalakshmi	28yrs	F	74510	17-08-2011	28-09-2011	80	110/80	98.4F	N	N	N	Myasthenia Gravis
52	Radha	23yrs	F	94578	24-09-2011	28-09-2011	84	110/70	98.4F	N	N	N	Hanging
53	Jeyakumar	37yrs	M	89732	18-09-2011	28-09-2011	72	110/70	98.4F	N	N	N	GBS

MASTER CHART PHASE III TRIAL - PATIENT SAMPLE													
CBC				RFT					LFT				
Hb	TC	DC	PL	Sugar	Urea	Creatine	Na	K	TB	DB	OT	PT	TP
11.8	6560	72/27/2	1.38	132	26	0.8	145	3.9	0.9	0.3	28	40	6.5
10.8	7500	70/28/2	2.5	109	30	1	143	3.8	0.8	0.3	20	32	6.2
12.4	6832	67/30/3	2.5	121	28	1	140	4	1	0.4	25	38	6.4
11.8	7700	60/38/2	2	113	34	1.2	135	3.5	0.7	0.2	28	40	5.4
10.7	4675	72/27/1	2.7	120	20	0.6	145	3.9	0.9	0.4	25	39	7
12.9	6800	76/22/2	2	92	19	0.9	146	4.2	1	0.4	21	22	5.8
12.6	7900	71/26/3	1.2	78	26	1	145	3.5	0.7	0.2	24	36	6.2
9.2	6200	70/26/4	1.01	65	40	1	134	4.5	0.8	0.2	29	31	5.8
10.9	4800	60/39/1	4	128	30	0.7	138	3.8	0.9	0.3	24	28	6.2
9.8	4500	53/42/5	1.6	128	26	0.8	143	3.5	0.9	0.4	28	36	6.2
11.8	7800	60/38/2	1.47	108	32	1	140	3.5	0.8	0.3	28	32	7
11.9	4545	72/27/1	2.6	72	20	0.7	120	4	1	0.4	24	36	6.9
10.2	4500	53/42/5	1.4	128	22	0.8	135	3	1	0.4	24	29	6.2
12.8	4700	76/22/2	1.38	127	28	0.9	138	3.5	0.8	0.2	27	32	5.8
12.6	7700	71/26/3	2.2	32	26	0.9	138	3.5	0.9	0.2	28	32	6.4
12.4	4700	68/30/2	2.8	90	28	1	143	4.3	0.7	0.2	23	30	6.8
12.8	6700	75/23/2	3.2	128	44	1.2	146	3.5	1	0.4	28	32	7
10.3	9000	74/23/3	1.01	124	39	1.4	130	3	0.8	0.3	23	40	7
11.2	4395	60/31/3	1.5	100	44	1.2	145	3.9	0.8	0.2	32	40	6.7
12.4	4390	56/40/4	1.2	109	38	0.7	138	4	0.8	0.2	31	43	7
11.8	6570	49/48/3	1.7	120	42	1.1	140	3.6	0.9	0.2	25	38	6.2
10.8	7600	60/38/2	1.48	110	32	1	144	3.7	0.9	0.2	28	32	6.8
10.8	7500	68/31/1	3.2	122	32	1.1	140	4.7	1.2	0.3	27	44	6.6
13.4	7200	60/34/1	1.46	120	44	1.2	138	3.6	0.9	0.3	28	33	6.4
13	9600	75/24/1	1.32	94	30	1	135	3.5	1.2	0.3	27	42	7
10.3	9000	74/23/3	1.01	124	39	1.4	130	3	0.8	0.3	23	40	7
9.8	7800	60/38/2	1.48	112	35	1.2	137	3.5	0.8	0.2	32	42	6.8
11.2	6550	49/48/3	1.8	119	43	0.9	147	3.8	0.8	0.2	28	30	6.2
10.2	9300	74/23/3	3.3	124	40	1.2	134	3.6	0.9	0.3	29	34	6.6
13.8	7900	68/29/3	3.2	121	27	1	140	4.2	0.6	0.1	20	32	6.1
11.2	7600	60/38/2	1.48	107	31	1.2	135	3.8	1	0.3	28	36	6.2
11.8	7800	74/24/1	2.5	90	38	1	135	4	0.9	0.3	30	28	7
11.2	6550	49/48/3	1.8	119	43	0.9	147	3.8	0.8	0.2	28	30	6.2
11.2	7600	60/38/2	1.48	107	31	1.2	135	3.8	1	0.3	28	36	6.2
11.8	7800	74/24/1	2.5	90	38	1	135	4	0.9	0.3	30	28	7
9.5	8600	75/23/2	3.6	105	34	1	140	4.5	1	0.2	24	36	6
14.2	5600	60/34/1	1.48	120	44	1.2	132	4	1	0.3	28	30	6.5
13.8	8100	68/29/3	3.5	111	38	0.7	145	3.8	0.7	0.2	24	28	5.8
11.8	7600	60/38/2	1.6	103	32	1	141	4.2	1	0.3	28	30	6.5
11.6	6970	49/48/3	1.8	90	40	1	145	3.8	0.8	0.2	26	30	7.2
12.5	6230	55/47/3	1.45	125	26	0.7	137	3.1	0.6	0.1	28	16	6.2
14.2	5600	60/34/1	1.48	120	44	1.2	132	4	1	0.3	28	30	6.5
10.3	9000	74/23/3	1.01	124	39	1.4	130	3	0.8	0.3	23	40	7
13	9600	75/24/1	1.32	94	30	1	135	3.5	1.2	0.3	27	42	7
11.8	7600	60/38/2	1.6	103	32	1	141	4.2	1	0.3	28	30	6.5
11.8	7800	74/24/1	2.5	90	38	1	135	4	0.9	0.3	30	28	7
12	6110	66/32/2	2.5	110	39	1.1	130	4.2	1	0.3	22	35	6.8
13	7500	68/30/2	2	109	31	0.7	137	3.6	0.7	0.2	22	27	6.2
10.6	7800	75/24/1	3	124	28	0.6	138	4.2	0.9	0.2	28	36	6.5
10.3	9000	74/23/3	1.01	124	39	1.4	130	3	0.8	0.3	23	40	7
13	9600	75/24/1	1.32	94	30	1	135	3.5	1.2	0.3	27	42	7
13.2	7600	68/29/3	3.2	95	38	0.9	140	3.2	0.9	0.2	21	27	6.6
12.5	6230	55/47/3	1.45	125	26	0.7	137	3.1	0.6	0.1	28	16	6.2

MASTER CHART III TRIAL - PATIENT SAMPLE					
HIV	**Intervention**	**Blood Culture**	**Urine Culture**	**Tracheal Culture**	**CVP Catheter Tip Culture**
negative	none	*	**NO GROWTH**	*	*
negative	intubation	*	*Candida spp*	*Staphylococcus aureus,Corynebacterium spp*	*
negative	none	*	*E.coli*	*	*
negative	intubation	*	*Candida spp*	INSUFFICIENT SAMPLE	*
negative	none	*	*Klebsiella oxytoca*	*	*
negative	none	**NO GROWTH**	**NO GROWTH**	*	*
negative	tracheostomy	*	*	*Staphylococcus aures,NFGNB*	*
negative	tracheostomy	*	*	*Staphylococcus aureus*	*
negative	none	*	**NO GROWTH**	**NO GROWTH**	*
negative	none	*	*Candida spp*	*	*
negative	none	*	*Klebsiella pneumoniae*	*	*
negative	none	**NO GROWTH**	*Klebsiella oxytoca*	*	*
negative	none	*	*Candida spp*	*	*
negative	none	*	*Pseudomonas aeruginosa,Candida spp*	*	*
negative	intubation	*	*Klebsiella oxytoca*	*Acinetobacter spp,Pseudomonas aeruginosa,Corynebacterium spp*	*
negative	none	*	*Coagulase negative Staphylococci*	*	*
negative	intubation	*	**NO GROWTH**	*Acinetobacter spp,Staphylococcus aures,Corynebacterium spp*	*
negative	intubation	**NO GROWTH**	*Candida spp*	*Acinetobacter spp,Pseudomonas aeruginosa*	*
negative	none	*	**NO GROWTH**	*	*
negative	none	*	*Klebsiella pneumoniae,Candida spp*	*	*
negative	intubation	*	**NO GROWTH**	*Staphylococcus aureus,Corynebacterium spp*	*
negative	tracheostomy	*	*Acinetobacter spp*	*Staphylococcus aureus,Corynebacterium spp*	*
negative	intubation	*	*Candida spp*	*Staphylococcus aureus*	*
negative	none	**NO GROWTH**	*Enterococcus spp,Candida spp*	*	*
negative	tracheostomy	*	**NO GROWTH**	*Staphylococcus aureus*	*
negative	tracheostomy	*	*Enterococcus spp,Candida spp*	*Staphylococcus aureus,Corynebacterium spp,Pseudomnas aeruginosa*	*
negative	none	*	**NO GROWTH**	*	*
negative	none	*	*Enterococcus spp*	*	*
negative	tracheostomy	**NO GROWTH**	*Esherichia coli,Candida spp*	*Acinetobacter spp,Pseudomonas aeruginosa,Corynebacterium spp*	**NO GROWTH**
negative	intubation	*	**NO GROWTH**	**NO GROWTH**	*
negative	none	*	*Klebsiella oxytoca*	*	*
negative	intubation	*	*	*Acinetobacter spp*	*
negative	none	*	*Enterococcus spp*	*	*
negative	none	**NO GROWTH**	*Enterococcus spp,Candida spp*	*	*
negative	tracheostomy	*	*Klebsiella pneumoniae*	*	*
negative	none	*	*	*Coagulase negative Staphylococci,Enterococcuc spp,Candida spp*	*
negative	tracheostomy	**NO GROWTH**	**NO GROWTH**	*Klebsiella pneumoniae,Staphylococcus aureus*	*
negative	intubation	*	*Candida spp*	*Acinetobacter spp,Pseudomonas aeruginosa,Corynebacterium spp,Candida spp*	*
negative	tracheostomy	*	**NO GROWTH**	NFGNB	*
negative	intubation	**NO GROWTH**	*	*Staphylococcus aureus*	*
negative	intubation	*	*Pseudomonas aeruginosa*	**NO GROWTH**	*
negative	tracheostomy	**NO GROWTH**	*Klebsiella oxytoca*	*	*
negative	tracheostomy	*	*Acinetobacter spp*	*Staphylococcus aureus*	**NO GROWTH**
negative	tracheostomy	*	*Candida spp*	*Coagulase negative Staphylococci,Staphylococcus aureus*	*
negative	tracheostomy	**NO GROWTH**	*Esherichia coli*	**NO GROWTH**	*
negative	tracheostomy	*	*	*Coagulase negative Staphylococci,Candida spp*	*
negative	intubation	*	*	INSUFFICIENT SAMPLE	*
negative	intubation	*	*	*Enterococcus spp*	*
negative	none	**NO GROWTH**	*Candida spp*	*	*
negative	tracheostomy	*	*Esherichia coli*	*Staphylococcus aureus*	*
negative	tracheostomy	*	*Acinetobacter spp*	*Klebsiella pneumoniae*	*
negative	intubation	*	*Candida spp*	**NO GROWTH**	*
negative	intubation	**NO GROWTH**	*Klebsiella pneumoniae*	*Coagulase negative Staphylococci*	*

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OUR INTENSIVE MEDICAL CARE UNIT

PREVENTIVE MEASURES INTRODUCED

1. Fumigation

2. Daily Mopping of the floors, Cleaning of walls and windows

3. Cleaning of wash basins and bathrooms

4. Proper hand washing

5. Changing of bed linens, screens

6. Maintaining the cleanliness around the patient

7. Proper waste disposal

8. Use of aprons, caps, masks

9. Attenders education

10. Limiting the entry of attenders

11. Collection of swabs

PATIENT CONSENT FORM

STUDY DETAIL

"STUDY OF BACTERIOLOGIC PROFILE IN CRITICAL CARE SETTINGS AND EFFECTS OF PREVENTIVE MEASURES"

STUDY CENTRE : Rajiv Gandhi Government General Hospital, Chennai.

PATIENTS NAME :

PATIENTS AGE :

IDENTIFICATION NUMBER :

Patient may check (√) these boxes

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ☐

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ☐

I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ☐

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ☐

I hereby consent to participate in this study. ☐

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests. ☐

Signature/thumb impression:

Patients Name and Address: Place Date

Signature of investigator :

Study investigator's Name : Place Date

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No: 04425305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. S. Anne Princy
PG in MD General Medicine
Madras Medical College, Chennai -3

Dear Dr. S. Anne Princy

The Institutional Ethics Committee of Madras Medical College reviewed and discussed your application for approval of the project / proposal / clinical trail entitled "Study of Bacteriologic profile in critical care setting and effects of preventive measures" No. 10102010.

The following members of Ethics Committee were present in the meeting held on 22.10.2010 conducted at Madras Medical College, Chennai -3.

1. Prof. S.K. Rajan, MD	-- Chairperson
2. Prof. J. Mohanasundaram, MD,Ph.D,DNB Dean, Madras Medical College, Chennai -3	-- Deputy Chairman
3. Prof. A. Sundaram, MD Vice Principal , MMC, Chennai -3	-- Member Secretary
4. Prof R. Nandhini, MD Director, Institute of Pharmacology, MMC, Ch-3	-- Member
5. Prof. Pregna B. Dolia , MD Director, Institute of Biochemistry, MMC, Ch-3	-- Member
6. Prof. C. Rajendran , MD Director, Institute of Internal Medicine, MMC, Ch-3	-- Member
7. Prof. Md. Ali, MD, DM Professor & Head ,,Dept. of MGE, MMC, Ch-3	-- Member
8. Thiru. S. Govindasamy BA.BL	-- Lawyer
9. Tmt. Arnold Soulina	-- Social Scientist

We approve the Proposal to be conducted in its presented form.

Sd /. Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information / informed consent and asks to be provided a copy of the final report

Member Secretary, Ethics Committee